

# POPULAR SCIENCE

MONTHLY

SEPTEMBER

15¢



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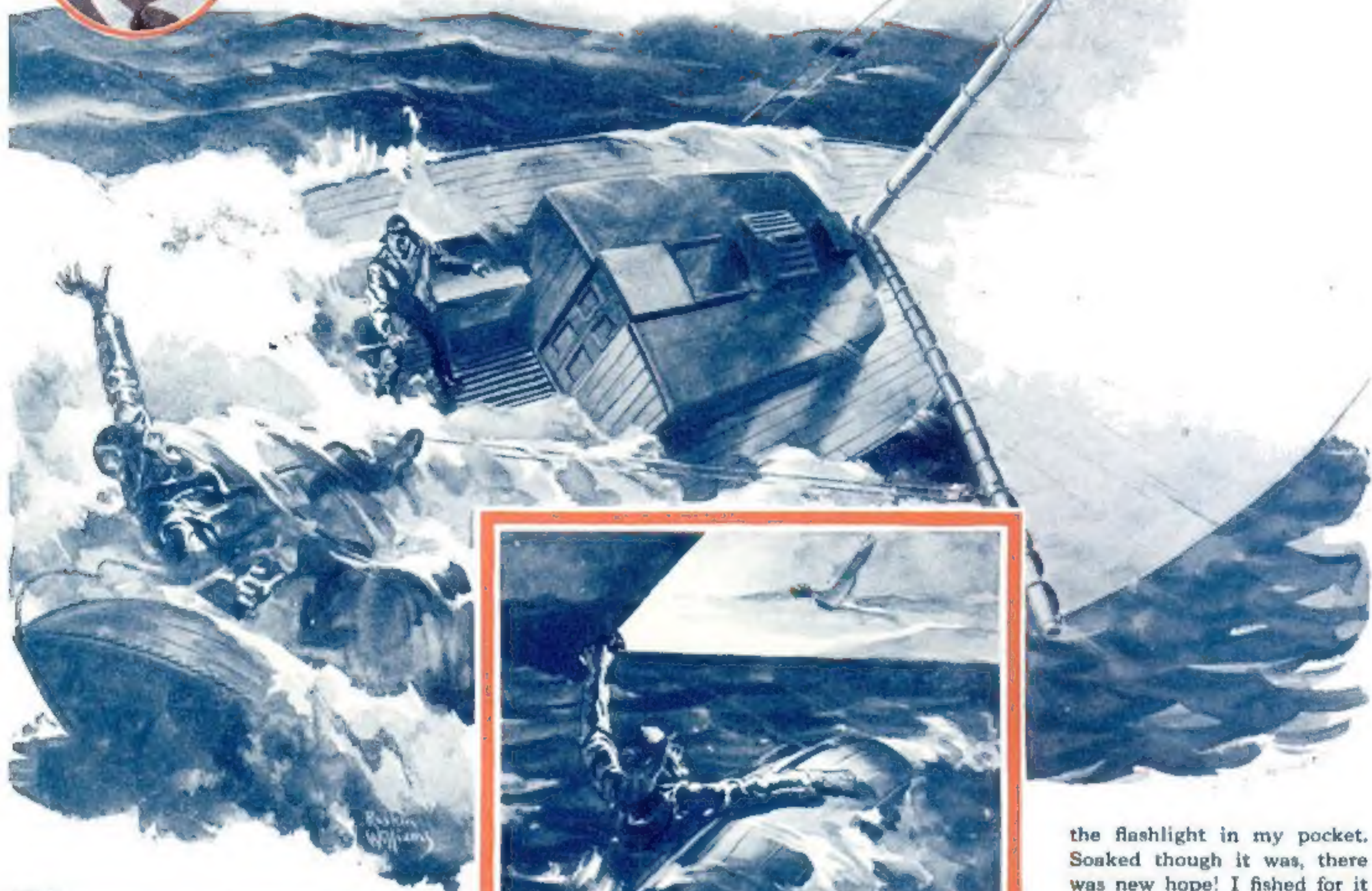
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# "Goodbye World! My Ship Faded into the Night!"



**Overboard in Storm, Yachtsman Clings to Capsized Dory as Sloop Holds Course**



"MY FORTY-FOOT SLOOP was footing it up Long Island Sound like a scared cat before a stiff sou-west breeze," writes Tom Meyer of 280 Bronxville Road, Bronxville, N. Y.

"It was cold and wet aboard so I was in boots and oil skins. At midnight, off Smithtown Bay, it really began to blow. My partner, Larry Starr, was below catching a nap, and a friend who had done no sailing before, was with me in the cockpit. I asked him to take the tiller while I got the dinghy we were towing, in on the deck. I was afraid she might get away from us, or smash against the stern with that following sea.

"I had the dinghy halfway on deck when an extra big comber came pounding over the stern. Solid water swept my feet out from under me and overboard I went, weighted down by my heavy-weather gear. I still clung to the dinghy, but its painter came adrift and my ship pulled away from me at a furious pace, faded quickly into the black night.

"The lad at the tiller didn't know how to bring the boat about, just sat there frozen with terror. And there was I, in the middle of the vast, heaving Sound, unable to swim, clinging to an overturned dory, and lost, utterly lost in the blackness!

"Sooner or later, the frightened helms-



man would waken Larry, and he would put back to pick me up. But the boat was already so far away they'd never find me in the dark. My teeth were chattering with the cold, my fingers getting numb. Pretty soon I'd let go and then . . . goodbye world and all I meant to do. I rolled against the gunwale of the dinghy to get a fresh grip and felt something hard dig into my side...

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the flashlight in my pocket. Soaked though it was, there was new hope! I fished for it with one hand, hung onto the boat with the other. I pressed the switch and a finger of light stabbed through the storm! I played it around me and prayed for strength to hang on! Then I cursed my shipmates 'Why can't the fools see my light?,' I asked the wind and waves, and then . . . the beam caught in a white sail, the sail of my own boat! I screamed down the wind for joy, an arm waved encouragement. Minutes later, thanks to those *fresh* DATED 'Eveready' batteries that kept working under the toughest conditions imaginable, I was warm and happy in my own bunk on my own ship, our Block Island cruise resumed.

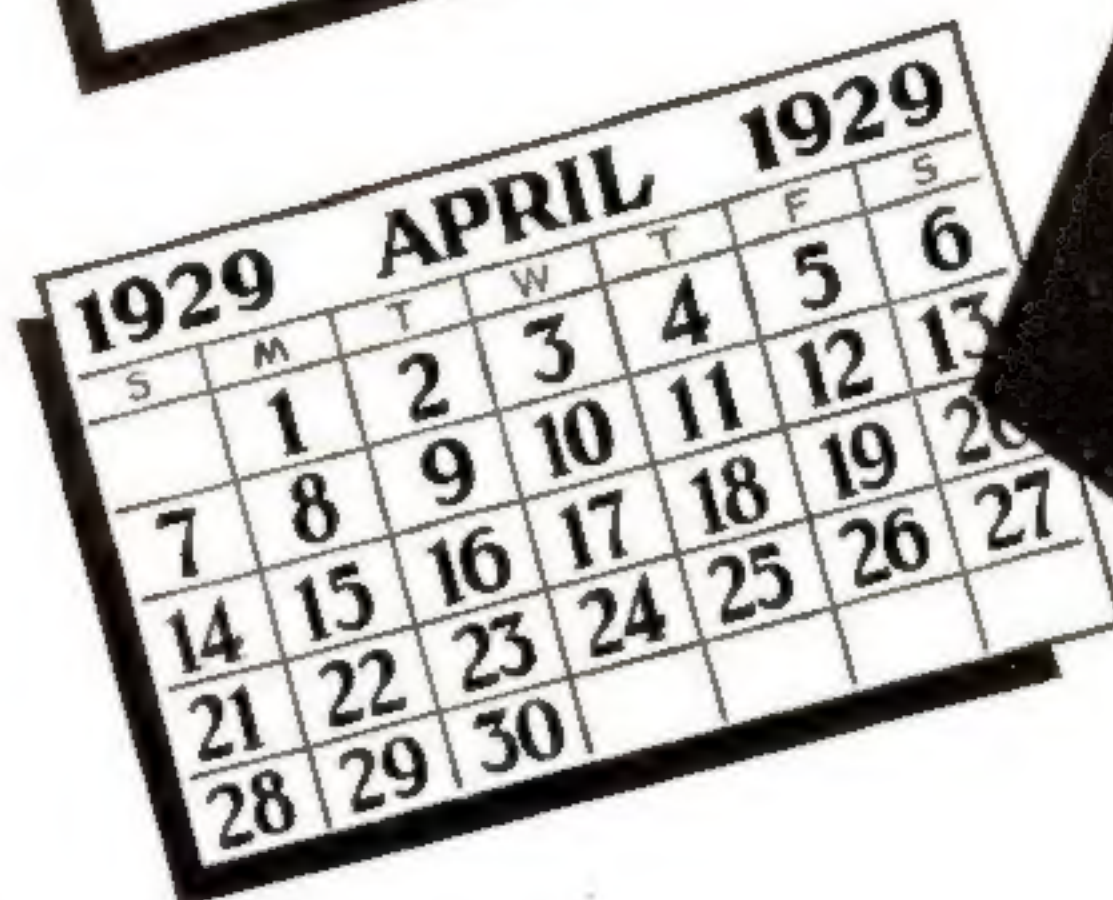
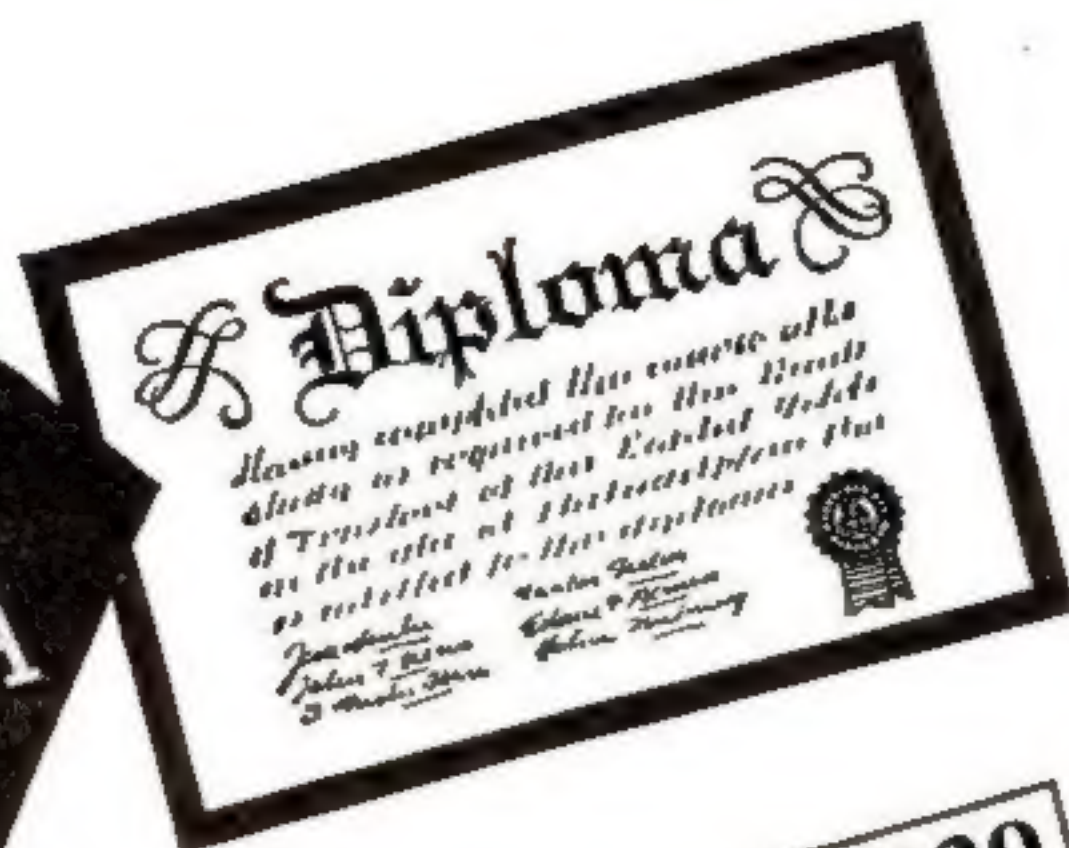
(Signed)

*Tom Meyer*





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COVER DESIGN BY EDGAR F. WITTMACK

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# Our Readers Say



## Here's a Job for Inventive P. S. M. Readers

SORRY, but the swinging-reflector unit for automobile headlights gets in my hair, and I'm afraid its beams would still get in the eyes of other motorists. Congratulations to its inventor, however, for trying. He recognizes what every driver sooner or later does, that today's automobile headlights, good as they are, are far from perfect. For the brighter we make them for our own use, the more we hinder the ability of the fellow coming toward us to see. I can't think of a more constructive "problem" for the problem fans of "Our Readers Say" to work on than this, namely, a good substitute for headlights.—O.V.L., Camden, N. J.

TAKE CARS AWAY FROM 75% OF THE DRIVERS IS THE ANSWER!



## An Article This Chemist Would Really Appreciate

SOMETIME would you publish an article on the industrial method for determining the sugars in fruits? Many amateur chemists like myself would appreciate it.—E.W.P., Burlington, Iowa.

## Hydro-eel-ectric Power That's Cheaper by a Dam Site

BY GOLLY! There may be more than we think to this business of the Government putting beavers to work for us. Six hundred of them, according to the papers, at eight dollars apiece, are to be put in the streams of Idaho this year to build dams for a soil-conservation project. It is expected they'll slow up the streams and provide irrigation for agricultural revitalization of eroded land, with resulting soil and other improvements estimated in value at \$300,000. Many think that the Government has gone too far already in competing with private industry in building dams, power works, and so on. At the risk of incurring the enmity of this group, I would like to suggest a plan to broaden the effectiveness of the beaver project,—one that's right up the Government's alley, too. Why can't the Government buy some of those electric eels that give off electric shocks when they're annoyed, put them in the ponds and pools that the beavers create with their dams, and then dangle recalcitrant Congressmen over the streams to annoy the eels to make them give off electricity. There you have a perfect hydro-electric-power system that would make the alleged economies of the TVA look like the bill for the Sino-Japanese War. Idaho, here we come!—P.A.T., York, Pa.

WHY DANGLE THEM?



## He Can Still Poke Along to His Heart's Content

IF E. J., Jr., who writes in your July issue that he wonders what will become of the sight-seers and tourists of the nation when highways permit cars to travel at high speeds, will open his May issue to a diagram of the courses of the proposed highways, I believe he will find the explanation. POPULAR SCIENCE didn't say that all roads would be made into super-superhighways. Just as the cow-paths of yesterday are the country roads of today and the highways of tomorrow, today's cow-paths will just be country roads in the bright future, so E. J. can poke along to his heart's content. When these superhighways are realities in the times to come, I will write back and remind you of your prophecy. More power to you!—T.H., Janesville, Wis.

## Alternating-Current Theory Has Him Puzzled

BEFORE asking you to help me out of my difficulty, I am going to pat you on the back for putting out such a swell magazine. Now for the difficulty. It has to do with alternating current of electricity. I want to know just how the current alternates. Every book that I have studied on this subject goes only as far as saying that the current flows back and forth. It is impossible to think that it flows from one end of the conductor, or circuit, to the other, and I can't imagine it flowing in a wavy curve, positive part of the time, and negative the rest. Maybe I'm all haywire. If so, can some smart fellow help me out?—S.S.M., Cottonwood, Ariz.



## He's Entitled To Crow over the Solution

YOU CAN believe it or not, but I was having a luncheon of scrambled eggs and perusing my new copy of your magazine when my eye fell on S.B.'s problem, under the heading "Maybe You Can Unscramble This Egg Problem." I may say that no setting hen ever worked harder over an egg job than I did. But here's what I got: First, the boys agree to sell at the rate of seven eggs for a cent. They do, until A has one cent and three eggs left over, B has four cents and two eggs, and C has seven cents and one egg. They then agree to sell their remaining eggs at three cents each. A then realizes nine cents for his three eggs which gives him a total of ten cents. B realizes six cents for his two eggs which gives him a total of ten cents, and C sells his one remaining egg for three cents, which gives him, too, a ten-cent total. I've been reading your magazine about five years, and my only com-

plaint is that it's an awful long wait between issues. If only it came out twice a month or even weekly!—L.Y.N., Galveston, Tex.

## "You Can Please Some of the People . . ."

YOUR radio section, which is always featuring articles on receivers, gets a bit tiresome for us "hams" who like to read about transmitters. Let's have a little more on this "he-man" side of radio, and I don't mean one-tube oscillating circuits either. Let's have them tougher than that! How about this kind of radio articles hereafter?—D.S., Dearborn, Mich.



WHILE I am much interested in radio, I find your receiving sets too complicated and advanced. Why not publish a few articles explaining the fundamentals of radio as Marconi found them out. Then, when we understand the theory we could go on to simple sets, with more advanced ones coming later.—T.L., Treherne, Manitoba.

## Wants His Photography in a Single Dose

IT strikes me that if all your articles on photography were grouped in the same section, instead of being put in various parts of the magazine, it would be an improvement, even though each article is plenty good enough to stand up by itself. This would make for easier reading, and would allow the reader to clip and save the interesting articles you print. For, over a period of time, a person accumulates so many magazines that they must be disposed of. Why not make it easier for him to file his favorite sections for keeping?—F.C.W., Aberdeen, Wash.

## If Wishes Were Trailers, Beggars Would Be Tourists

ALTHOUGH I have no kick for P.S.M., I would like to give a gentle boot—well-aimed—to E. P. E., of Buffalo, N. Y., who wants accommodations built on the new streamline trains so that hoboes will continue to enjoy the conveniences to which they have become too well accustomed. Perhaps he'd like to see nice comfortable lean-to apartments added to all private homes and public buildings for the greater comfort of the modern hobo, and comfortable trailers hitched (Continued on page 6)





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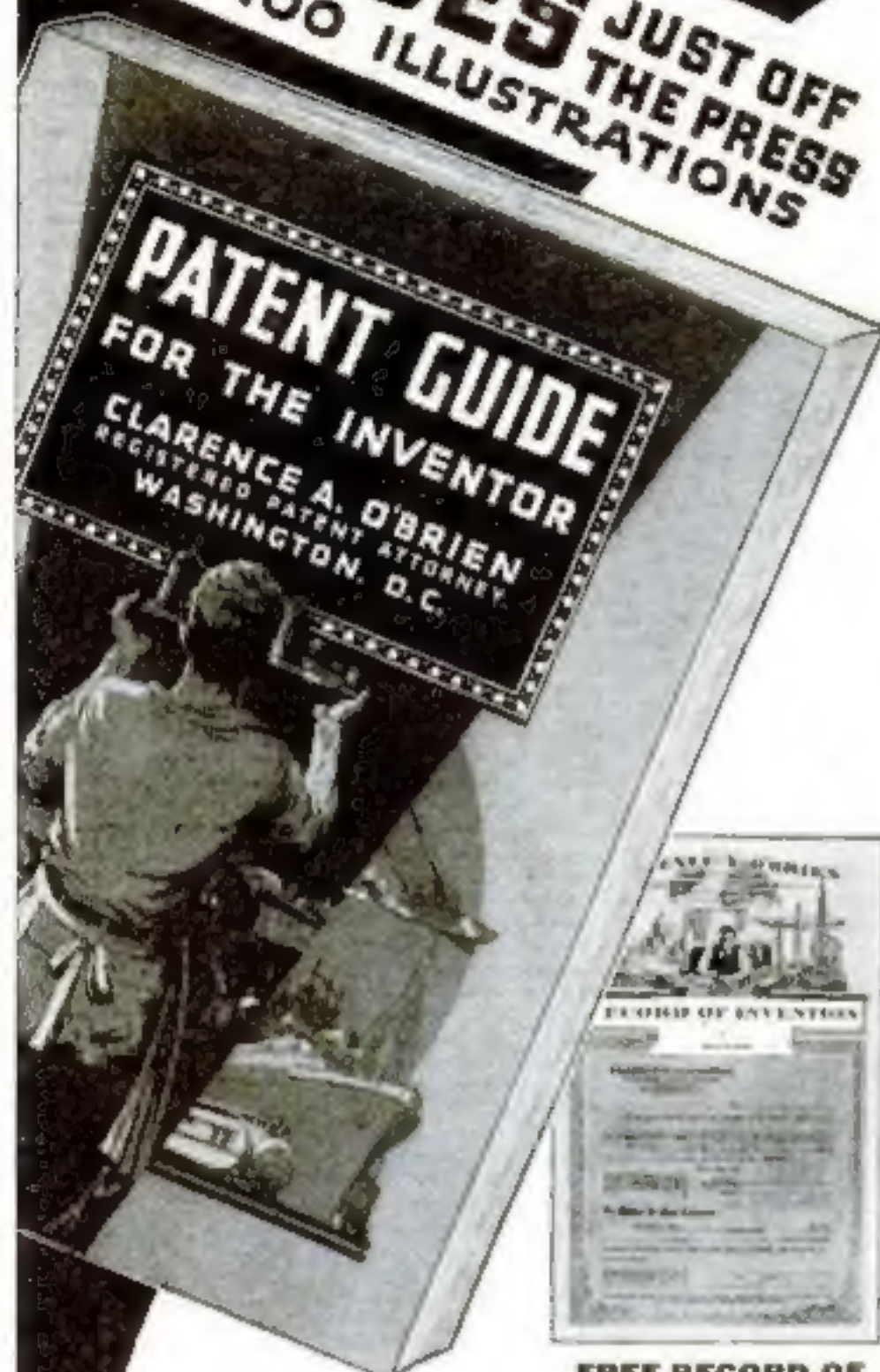
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## Our Readers Say

(Continued from page 4)

to all automobiles for the benefit of that peculiar modern offshoot of the hobo, the hitch-hiker. Oh, well! Please keep up your fine work on chemistry, and also on the "Question Bee."—C.W.S., Chattanooga, Tenn.

### They're Not Sharks, but They Do Work in Schools

W. C. S. SAYS his problem is a "tough one, and will probably knock the overconfidence of a few of the math sharks for a loop!" Lovers of mathematics are not sharks. Being human like the rest of us, they may sometimes want to bite, but there is no record of any victim ever losing an arm or a leg. As a class, they are gentler than dentists. (Oh yes, they extract roots, too.) Again, not many of them are overconfident; they serve a science of inexorable logic which has its own methods for keeping them humble. The problem proposed by W. C. S. depends on the finding of an angle whose tangent is the same as its radian measure. This is an old problem, and the confident mathematician reaches down into the bag and brings out the answer: 12 degrees, 32 minutes, and 47.775 seconds.—N.A., Ann Arbor, Mich.



### When Four Minus Two Equals What You Don't Expect

IN A recent issue you included an interesting article describing a device that helps you get cinders and whatnot out of your eyes. A mirror and magnifying glass are arranged so that you look at the reflection of your eye in the mirror through the magnifying glass. What I want to know is why the magnified image that is reflected back by the mirror is not reduced back to normal as it passes back through the lens to the eye. It seems to me like adding two to two and then subtracting two. You wind up with two, or back where you started. Maybe some student of optics can correct my doubtless faulty view of the matter.—B.M.B., Washington, N. J.

### Uncle Sam's New Navy Gets Some Attention

WHAT'S become of those swell ship articles by Theodore Gomme that have appeared in your magazine in the past? It is a long, long time since we've had any of them and the time is ripe—when isn't it?—for some more. I'd be particularly pleased to see one dealing with the newest ships of our Navy. Every time a new plane is developed, you conscientiously tell the world all about it. There are far fewer new ships than planes, so why not give

GOTTA DO SOMETHING  
ABOUT THIS.



us "sea-goin'" fans our share of our favorite department?—H.C.S., Chicago, Ill.

### In Defense of Dirigibles for Our Defense Program

SEVERAL readers have pondered the wisdom of more dirigibles for this country. I think we need them for our defense program, not to carry people across the ocean, since airplanes are faster and ocean liners still run; nor to drop bombs. We need dirigibles for observation purposes. They can rise higher than planes and can stay aloft for long periods. The *Macon*, with which I was familiar, could hide above the clouds. A "spy basket" let down 5,000 feet from that ship permitted an observer to watch the ground from just below the clouds without being seen. The ship could stay aloft several days and travel 10,000 miles without refueling. As for the money and lives spent and "lost" on airships, I have this to say. If it were in vain, it would be a sad thing. But it would be impossible to name one great accomplishment that has been furthered to any degree with no loss of life or money. If the families of the men who have given their lives to lighter-than-air craft can see and understand matters as they are, we, the other citizens, ought to try to do our little bit. I heartily disagree with the statement "in wartime, the airship is just a target."—Mrs. I.C., San Jose, Calif.

### Challenges Will Be Accepted Until the Printer Complains

THOSE remarkable, extra-long long words you've printed in several recent issues of your estimable magazine seem to have come to an end, leading me to think that I might get in the last word after all. The following is a legitimate, seventy-letter name for a complicated chemical molecule: para-sulfoorthomethoxybenzeneazodimethyl-alphanaphthylaminehydrochloride. Frankly, now, what is the longest word outside of the chemists' books?—W.D., Stamford, Conn.

CLAIMING THE LAST  
WORD SOUNDS  
LIKE A  
WOMAN!



### This Ought To Clean Up the Glassware Matter

HERE'S still another one for the amateur chemists troubled about removing stains from laboratory glassware. R. H. suggested sodium hydroxide. J. P. in June set forth the merits of sulphuric acid and potassium dichromate. Later, we hear of the unique idea of using just plain soap. I hold that nothing can beat aqua regia. When my equipment is stained or otherwise dirty, soaking in aqua regia does what nothing else will. It must be made up fresh in a room with the window open. If you ever have smelled its fumes, you will understand that precaution. Use three volumes of concentrated hydrochloric acid to one volume of concentrated nitric acid. The reddish liquid will dissolve even gold, so

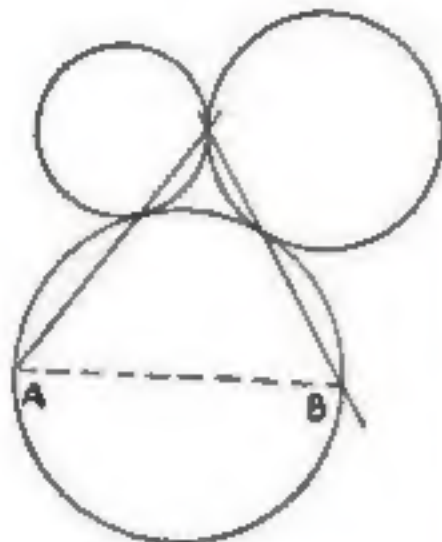


(Continued from page 6)

be careful not to spill it or get any of it on your skin or on your clothing.—G.L.C., New Orleans, La.

### It Appears True, but Can You Prove It?

HERE'S a problem that interests me a lot, but I can't solve it. Consider three circles, tangent to one another externally. Draw two chords through the points of tangency, and extend to intersect the one circle as shown. Where the extended chords intersect the one circle, connect with a third chord. The circles may be of various sizes. Prove that the third chord, AB, is the diameter of the circle. Get to work!—E.R.S., Michigan City, Ind.



### He Likes Better Coverage on Our Cover Pictures

PERMIT me to congratulate you on a change, a permanent one I hope, in your magazine. I noticed it first in the July issue, but refrained from writing until I saw it again in August. I refer to the cover illustrations which for the last two months have been accompanied inside the book by man-size articles describing them fully. Keep it up! Another thing I like is the "Classified" section, recently returned to your magazine after a long absence. Of course, I can't buy or send for everything in it, but I've often wished that this were possible to do.—L.T.M., Rome, N. Y.

### The Good Ship "Wanderer" Brought Him back to Port

AROUND Christmas in 1936, I received as a gift a kit of the *Wanderer*, ordered from you. Slightly over a year later I finished the model, having made everything myself except the deadeyes, belaying pins, and the ship's bell. I am enclosing pictures of the finished project, and at the same time I want to thank you for your part in giving me so many hours of pleasure. Late in September 1937, I fractured my leg. After leaving the hospital, most of my time was spent entirely working on the ship. Fortunately, I had completed the hull and some of the deck fittings, so I could work on it from a sitting position. The work kept me from thinking too much about myself, gave me a very pleasant pastime, and at the same time kept my hands in excellent condition (I am a dentist). I was away from my office for four months. After everything was normal again, I gave the model to the surgeon who made it possible for me to walk and resume my normal life again. He appreciates it, too, as he is a native of the Maine coast. I wish to say, too, that your blueprints and prints of previously published articles are excellent. Thanks for making all these things possible.—Dr. N.C.J., Bellefonte, Pa.

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Many Radio Experts Make \$30, \$50, \$75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to \$5,000 a year. Fixing Radio sets in spare time pays many \$300 to \$500 a year—full time repair jobs with Radio jobbers, manufacturers and dealers as much as \$30, \$50, \$75 a week. Many Radio Experts operate full or part time Radio sales and repair businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to \$6,000 a year. Automobile, police, aviation, commercial Radio, loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read their letters. Mail coupon.

There's a Real Future in Radio for Well Trained Men

Radio already gives jobs to more than 300,000 people. In 1937 Radio enjoyed one of its most prosperous years. Nearly \$500,000,000 worth of sets, tubes and parts were sold. Over 5,000,000 home Radios were sold—25,000,000 homes (4 out of 5 in the U. S.) now have one or more sets. Over 1,800,000 auto Radios were sold—5,000,000 cars now have Radios. Every year millions of sets go out of date, are replaced with newer models. Every year millions of dollars are spent on transmitting equipment. Television developments, etc. The \$30, \$50, \$75 a week jobs have grown from a few hundred 20 years ago to thousands today. And Radio is still a young industry—developing fast.

Many Make \$5, \$10, \$15 a Week Extra in Spare Time While Learning

The day you enroll I start sending Extra Money Job Sheets showing how to do Radio repair jobs. Throughout your train-

J. E. Smith, Pres. National Radio Institute Established in 1914

The man who has directed the home study training of more men for the Radio industry than any other man in America.

ing I send plans and ideas that made good spare time money—\$200 to \$500 a year—for hundreds.

I Give You Practical Experience

I send you special Radio equipment; show you how to conduct experiments, build circuits illustrating important principles used in modern Radio receivers, broadcast stations and loud-speaker installations. I show you how to build testing apparatus for use in spare time work from this equipment. This 50-50 method of training makes learning at home interesting, fascinating, practical. I ALSO GIVE YOU A MODERN PROFESSIONAL ALL WAVE, ALL PURPOSE RADIO SET SERVICING INSTRUMENT TO HELP FIX SETS QUICKER—SAVE TIME, MAKE MORE MONEY.

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Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL COUPON in an envelope, or paste on a postcard—NOW!

J. E. SMITH, Pres., National Radio Institute, Dept. 8JP3, Washington, D. C.

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J. E. SMITH, President, Dept. 8JP3

National Radio Institute, Washington, D. C.

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## USED TIME TRAVELING TO LEARN LAW COURSE

FOR MORE than three years, my time while riding between my home in Brooklyn and my place of employment in New Jersey, was occupied by either reading the newspapers, a magazine, or a novel. The total cost of such reading seemed too expensive in proportion to the benefits derived. Consequently, I began to wonder whether I could utilize my traveling time more advantageously.

After due deliberation, I enrolled for the law course offered by the — School. I enrolled not because I intended to practice law, but because I believed that a knowledge of legal procedure would be beneficial to me in practically every activity I undertook, either in business or elsewhere. I still recall the fascination and interest provided by the first lectures on the subject of contracts. Until that time, I had little or no idea that the simple dealings in the office, shop, and factory were often potential snares. Eventually, my legal studies enabled me to recognize issues which were detrimental to the best interests of my employers and my fellow workers at the plant. One of the definite results of my studies was my persistent election or appointment on executive councils of the company's interdepartmental organizations.

Upon completing my law studies, I enrolled in the short and pleasant course offered by the — School in business correspondence and letter writing. This step was prompted by my realization that my letters were not as concise, nor as compelling as some of the forceful memos and communications which came to my desk. I am happy to say that the course not only improved my writing ability, but it also improved my spoken words to the extent that my conversational speech is generally accepted as coming from a college graduate—yet I spent less than two years at high school in Brooklyn.

Within two years, I was promoted to junior executive in charge of personnel problems. My first home-study course began in 1923, the second in 1925. Since then, several courses in military subjects forwarded to me from Reserve Corps headquarters have provided me with further insight into the effectiveness of home study.

In 1930, when it became necessary for my organization to retrench, hundreds were dismissed, yet I was retained until the final liquidation of my division. Within a week, my qualifications came to the attention of a firm in Latin America. My only drawback was my inability to speak and write

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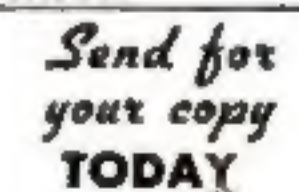
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Spanish. I assured my prospective employers that I would do my utmost to acquire the new language quickly. My enthusiasm and my record in my old job seemed favorable, so I got the position. I immediately sent for the

School's course in Spanish, studied the lessons, and now handle Spanish correspondence with as much facility as I handle English correspondence.

More than seven years have passed since my engagement by the Electric Co. I have had four substantial salary increases.—J.B., San Juan, Puerto Rico.

## HER COLLEGE DEGREE WAS NOT ENOUGH

IT IS not unusual to hear of successful careers gained through home-study courses by young people in their teens and twenties. As one grows older, it is very hard to settle down to a routine of study, especially when one is thirty-five, and a busy housewife and mother.

I have a college degree, but that degree didn't equip me to go out and work in an office. My husband and I had a hard time making a "go" of it during the depression, and the thoughts of debts piling up every month soon undermined my health. After spending several weeks in a hospital, with nothing to do but worry about the future, I decided to prepare myself for clerical work.

I had heard of a newer and faster method of shorthand. I enrolled with the School, and learned to take slow dictation and transcribe accurately and quickly. I passed the theory tests with high grades. I became more enthused every day. I had dreams of some of our good friends giving me an office position, but I soon found out that married women were not being given preference, and especially any one over thirty.

The ease of learning the theory of this study impelled me to believe I could teach it. After talking with the principal of an old and reliable private school, I was assured of a part-time job as teacher if I could prove to him that this new method of shorthand was faster than the one that had been taught in his school for more than forty years. Of course, my college qualifications were an asset here. At the end of three months successfully teaching this study, the School gave me a teacher's certificate. I had no trouble keeping my class ahead of any other theory or dictation class—much to the satisfaction of the owner of the school.

At the end of a year, I had earned enough to pay that \$380 doctor-and-hospital bill. I do all my own housework—and I am no slouch at that—keep my family's appearance equal to others where the mother is at home all day.

True, I had to give up my bridge



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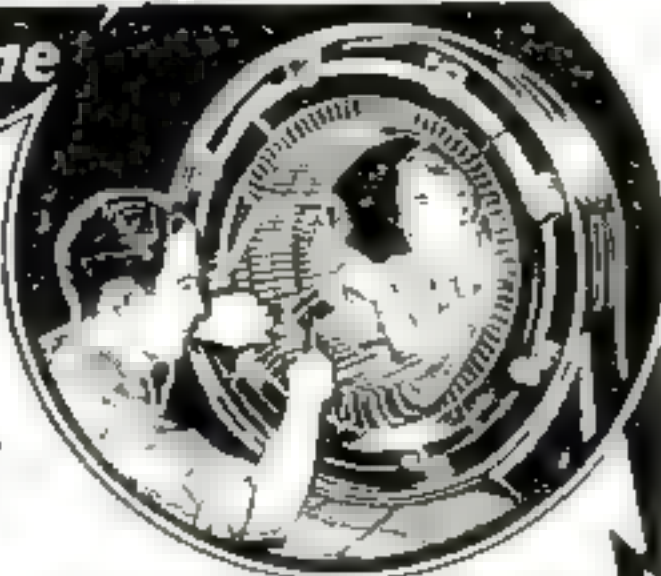
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and other social functions, but we are a happy family "getting out from under"—all because I had the foresight to take up this wonderful course of home study. A general four-year college course does not answer all needs in this day of specialization. I am glad I "specialized" through a correspondence course with the — School. —Mrs. R. S., Bridgeport, Conn.

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SINCE leaving the — School, I have been constantly employed in the Diesel field, advancing from my first job as ordinary operator several steps ahead to my present job as chief engineer of the — Corp. From my experience, I wish to urge every student, or anyone who intends to go into the Diesel field, to give his whole attention to gaining a thorough knowledge of the equipment he expects to handle. That is the type of preparation I received at the — School, and I realize how much it has helped me advance in this work. Also, in my experience of hiring men, some of them — School graduates, I have observed that the man who goes farthest is the man who has had the preparation and who has spent his efforts to get it thoroughly.—R.E.L., Los Angeles, Calif.

## ACCOUNTING LESSONS BROUGHT BENEFITS

I BELIEVE I can say that I owe all my advancement during the last fifteen years to the course taken with the — Schools. I had had a four-year high-school course in commercial subjects, and was working as time-keeper and lumber grader for the — Co. when I was offered the opportunity of becoming their cost accountant. I accepted the offer, and immediately enrolled with the — Schools for a course in certified public accounting. Before finishing it, I was made the company's Vermont office manager, and later, its traveling auditor. During a shut-down of the mill, I was able to pick up some accounting and auditing work to help with the living expenses and keep me off charity. About five years ago, the manager of our municipal office died, and because of my training in accounting and management, I was given that job, which I am still holding.

Since I finished my course, I have purchased several reference books from the — Schools for further study, and I am thoroughly convinced that anyone can make a success of home study if he takes subjects for which he is adapted and in which he has interest. I should probably still be working for day's wages as a time-keeper or lumber grader whenever and wherever I could find a job, if it hadn't been for my home-study course.—A.T.T., Concord, N.H.

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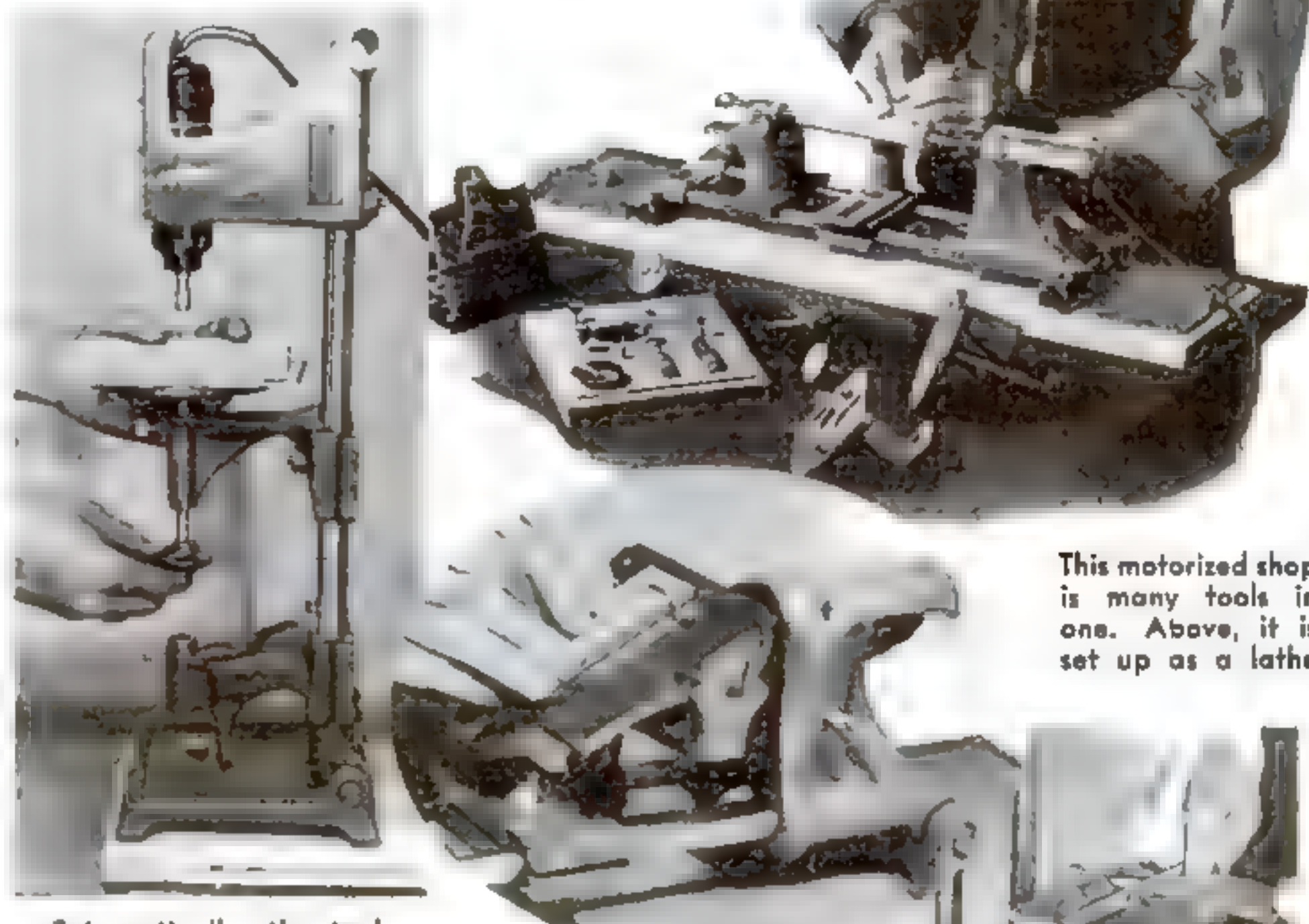
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# New Ideas FOR HOME MECHANICS



This motorized shop is many tools in one. Above, it is set up as a lathe

Set vertically, the tool serves as a drill press

POWERED by a motorized hand tool, a complete home workshop for making models and small novelties in wood or plastic materials is now available to home craftsmen. Complete with all accessories, the outfit provides a lathe having a capacity of nine inches between centers for work up to an inch and a half in diameter, a drill press, power saw that cuts at various angles, shaper, carver, sander, and grinder. Each of the tools is scaled down from standard-size professional specifications. The power unit may be removed from the head-stock for use as a portable hand tool.



In the two photographs above, the combination shop is being used as circular saw and shaper

## Tool for Electricians Cuts Cable Sheathing

METAL electric cable is cut open easily and safely with the precision tool illustrated below. When the cable is clamped by the tool jaws, turning a small handle revolves a circular steel saw to cut open the sheathing. Insulation is then sliced through with built-in shears.



## Lock Has Four-Way Key

UTILIZING a four-sided key, a new padlock for home use provides maximum protection in compact size. Sixteen locking surfaces and eight locking levers that move in four directions constitute the operating mechanism. Extensive tests are said to have proven the lock pickproof.





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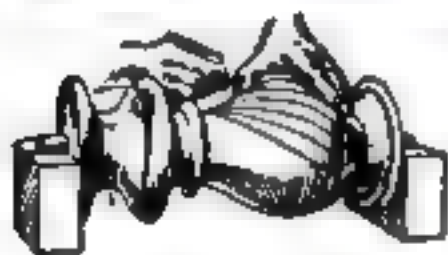
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Also, how to equip your home workshop, what hand tools you will need in addition to power machinery. All about wood joints.

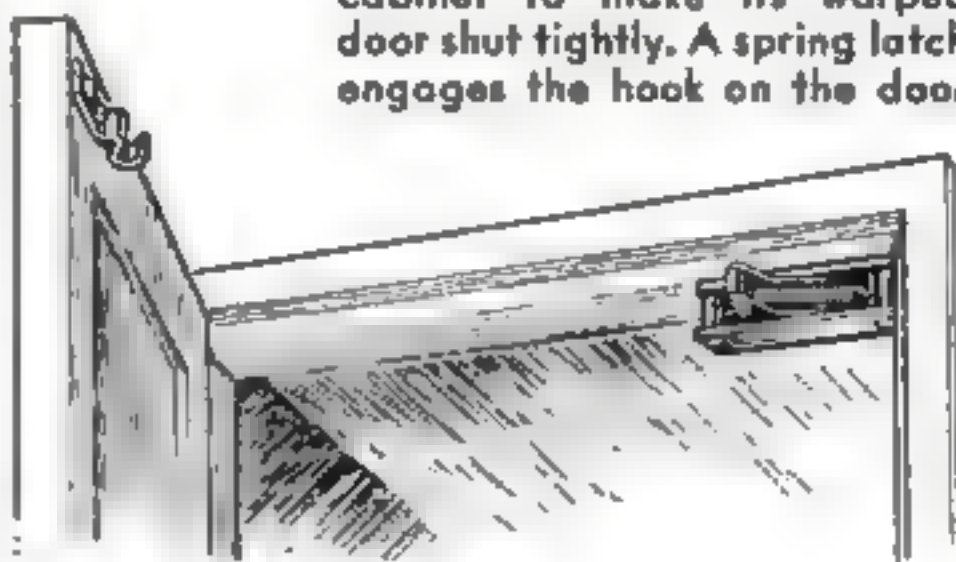
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## Automatic Door Catch Insures Snug Fit

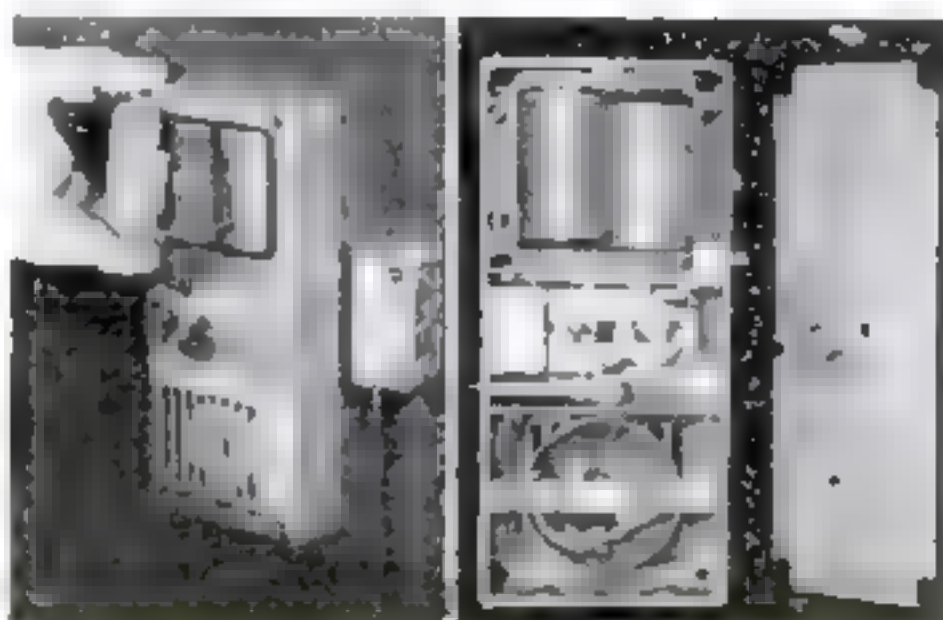


Installing the catch inside a cabinet to make its warped door shut tightly. A spring latch engages the hook on the door.



WARPED doors of cupboards or small closets can be made to close tightly with a compact catch that fastens inconspicuously within the closet at the top, bottom, or on a shelf. A spring-operated latch exerts a four-pound pull from within the cabinet to seat the warped edge snugly wherever it is necessary.

## Burglarproof Lock Has Alarm Bell



Front and rear views of the alarm-lock device

ESPECIALLY useful in protecting apartments, country houses, or small cottages from intruders, a novel alarm lock fits in place of any standard door lock and automatically rings a built-in electric bell if any attempt is made to tamper with the latch. As illustrated in the photographs above, the lock not only houses the electric bell behind a protective grill, but contains two dry cells that furnish the necessary power to ring it, dispensing with wires from a remote power supply. The conventional flash-light cells are easily replaced when worn out, and the apparatus is said to be so sensitive that even tampering with the door will set off the alarm.

## Are You Worried about holding your job?



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(Continued on page 19)



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## Learn Model Making

(Continued from page 18)



Kit G—Elizabethan galleon "Revenge"

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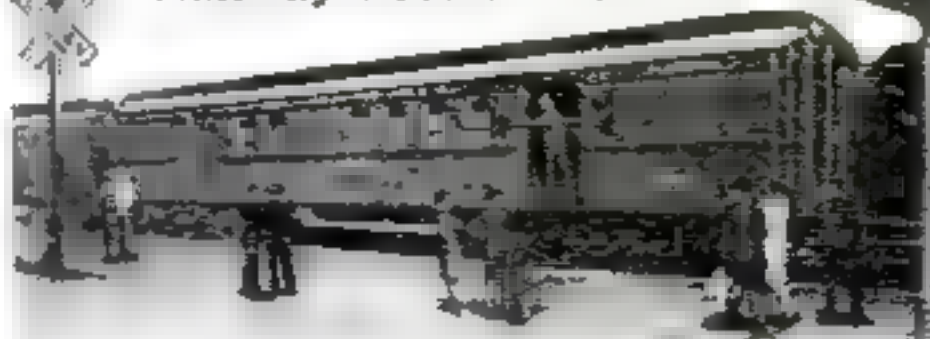
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# POPULAR SCIENCE IN A NEW SIZE

**—and a GREATER VALUE Than Ever!**

**W**ITH the next issue—October—POPULAR SCIENCE MONTHLY makes the most important change in its history.

About two years ago, in an effort to find a way to increase materially the quantity of reading matter in POPULAR SCIENCE MONTHLY, without increasing the price, the publishers undertook some reader-research studies. These studies were conducted with the advice and under the guidance of Dr. Henry Link of the Psychological Corporation. Studies were made among the readers of POPULAR SCIENCE MONTHLY . . . among the readers of other magazines in the field . . . and among the readers of general magazines. The results of these studies were conclusive. They showed that in general the readers of all periodicals preferred smaller-page-size magazines, *and that this preference was overwhelming.*

Therefore, POPULAR SCIENCE MONTHLY, from the October issue on, will appear in a smaller page size. In this new size we will be able to give readers a greater value than ever before has been possible.

**AVERAGE OF 272 PAGES PER ISSUE.** Heretofore the average number of pages in POPULAR SCIENCE MONTHLY has been about 130 to the issue. In the new size the average will be about 272 pages per issue.

**60 HOME WORKSHOP PAGES.** In the new size there will be an average of 60 Pages of Home Workshop projects. Formerly the average was 25.

**500 TO 600 ILLUSTRATIONS PER ISSUE.** Former issues of POPULAR SCIENCE MONTHLY have averaged 450 illustrations. In the new size the average will be between 500 and 600 to the issue.

**58 PAGES IN COLOR.** In the new POPULAR SCIENCE MONTHLY there will be an average of 50 pages of editorial material in 2 colors and 8 additional pages in 4 colors.

**NEW BINDING OPENS ABSOLUTELY FLAT.** Special binding equipment has been manufactured which eliminates the use of wire stitches through the sides of the book. This ingenious binding permits the magazine to open *flat*, which will be a

great convenience and comfort for both the work bench and the easy chair.

**SPECIALLY BUILT NEW PRESS.** To get the finest printing results we invested almost a quarter of a million dollars in completely new printing and binding equipment. The new, high-speed press, the fastest 2-color magazine press in the world, will enable us to manufacture this new POPULAR SCIENCE MONTHLY so economically that even with all the increases in value to the reader, no increase in price is contemplated.

**STILL 15c PER COPY—\$1.50 PER YEAR.** The new magazine will be greater in interest, page for page, than we have ever before produced. POPULAR SCIENCE MONTHLY, in this new size and with more than twice as many pages as heretofore, will still be 15c on the newsstands—\$1.50 per year.

Subscribers will find this dramatic new magazine full of exciting surprises. If you are a newsstand buyer, be sure to instruct your dealer to reserve a copy for you. Publication date of the October issue is set for August 31st.

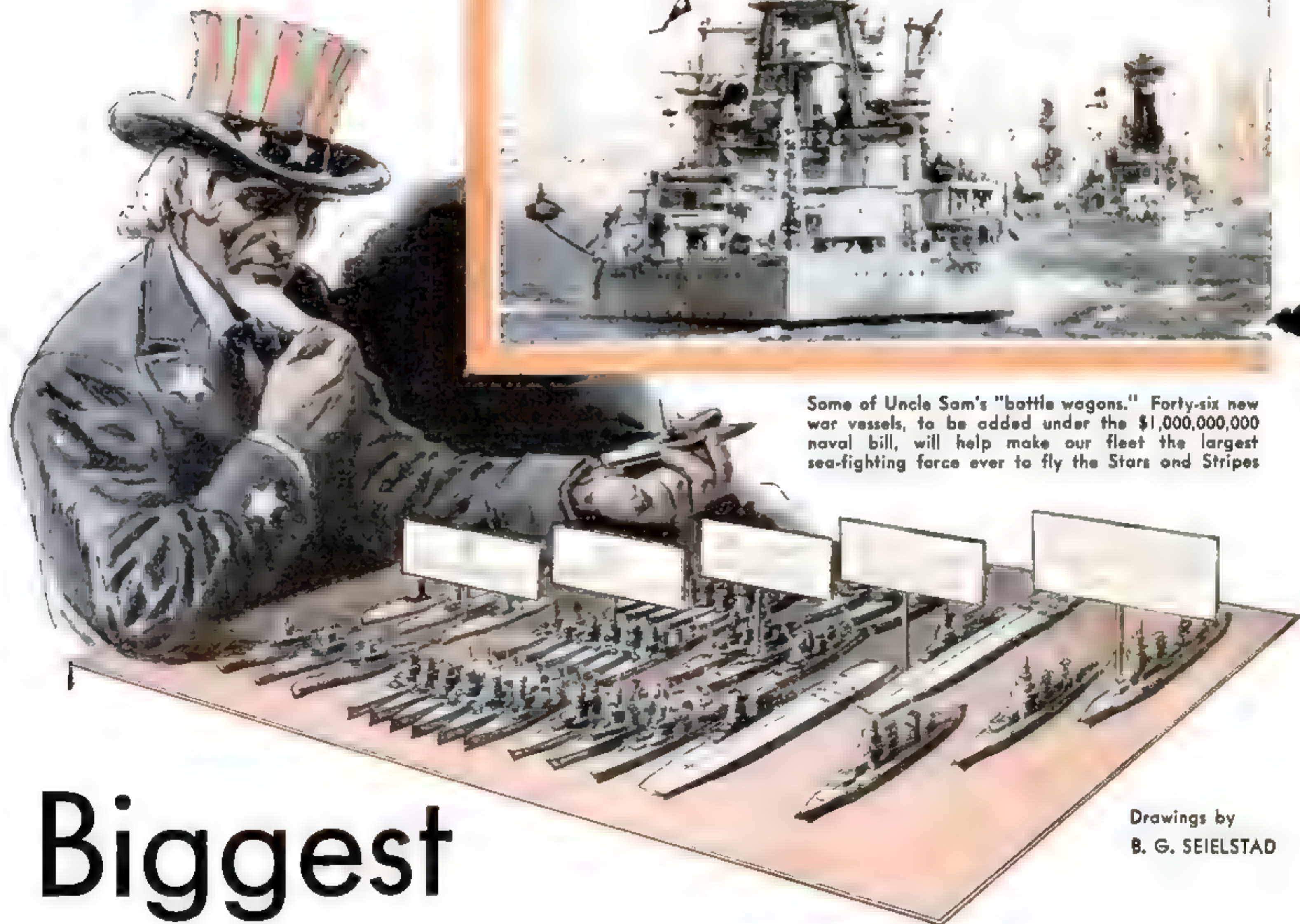


# POPULAR SCIENCE

*Monthly*

RAYMOND J. BROWN

Editor



Some of Uncle Sam's "battle wagons." Forty-six new war vessels, to be added under the \$1,000,000,000 naval bill, will help make our fleet the largest sea-fighting force ever to fly the Stars and Stripes

Drawings by  
B. G. SEIELSTAD

# Biggest American Navy

## PROMISED BY NEW FIGHTING SHIPS

**W**HEN the \$1,000,000,000 Naval Expansion Bill recently was passed by Congress, it assured that, a few years hence, the Stars and Stripes will fly over the most powerful sea-fighting force in American history. Together with the Vinson-Trammell Act of 1934, it provides for enough new dreadnoughts, destroyers, cruisers, submarines, and aircraft carriers to equal in tonnage the whole navy of France!

This huge program, made necessary

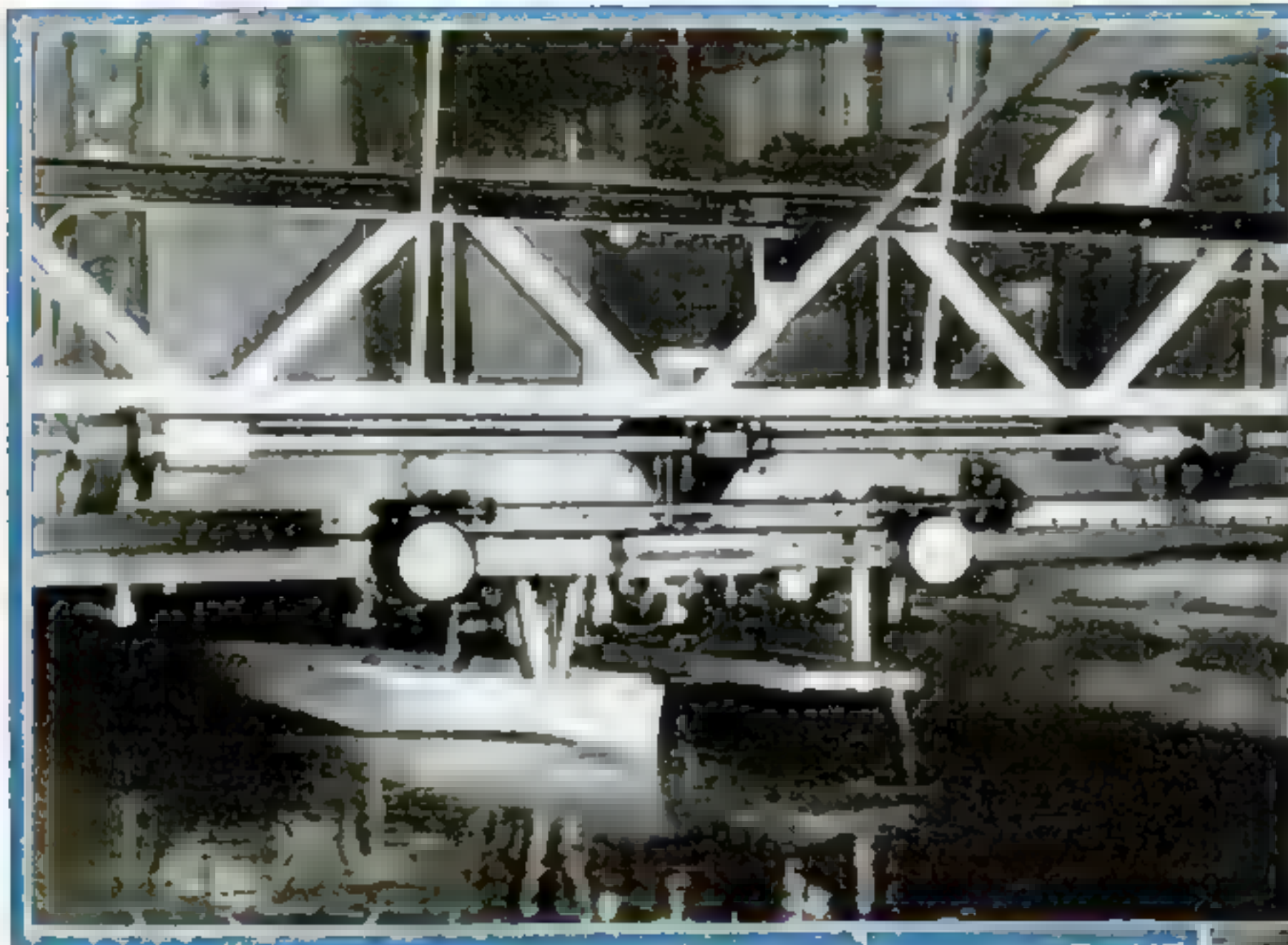
by the lapse of treaties and by warfare abroad, will enable Uncle Sam to guard his coastline with a navy seventy percent stronger than it is today. Only the British fleet will equal it in size, and scientific aids on the new ships will make the United States Navy the most up-to-date afloat.

By  
**JOHN E. LODGE**

To warships already projected under previous plans, the new Expansion Bill adds three superbattleships, twenty-three destroyers, nine cruisers, nine submarines, and two aircraft carriers.

While present plans call for a trio of 35,000-ton battleships, the bill permits the President to boost the tonnage to 45,000 tons—making the warships the hugest seagoing fortresses ever to plow the waves. A thousand feet long—longer than either the *Normandie* or the *Queen Mary*—such steel-clad fight-





Left, a scene in the experimental basin at Washington, D. C., where wooden hull models like the one being shaped below are towed through water

ers would have a belt of armor eighteen inches thick and would carry a quartet of citadel-turrets, each housing three sixteen-inch guns. Such armament, aided by sky observers, could rain screeching, one-ton shells on an enemy ship even before it appeared on the horizon!

The 35,000-ton "battle wagons" actually planned will be equipped with nine instead of twelve big guns. Even so, they will be more heavily armed than the present world's largest fighting ship, the 860-foot, 42,100-ton British battle cruiser *Hood*. The new dreadnoughts, 714 feet long, will embody the latest refinements in naval architecture. The firing turrets will be gas-proof, while a special turtleback armor will shield the decks from aerial bombs. Each ship will carry a battery of the latest quadruple-barreled pom-poms, or "hose guns," capable of pouring out an almost solid stream of slugs against

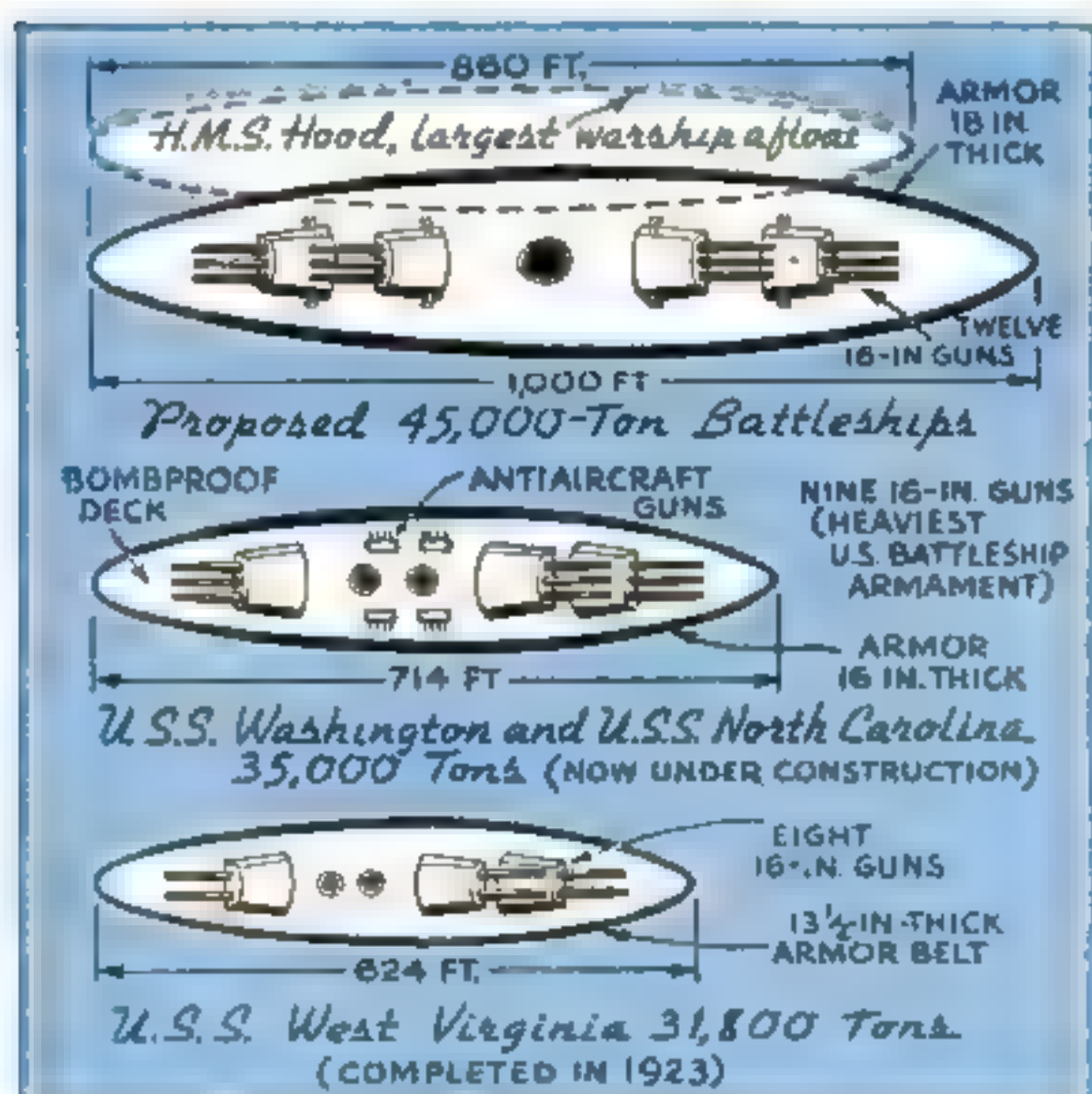
attackers from the sky.

Spinning four propellers, 100,000-horsepower steam engines will send the dreadnoughts cutting through the water at a top speed of approximately thirty-five miles an hour. An additional sheathing of armor will enclose the boiler rooms and form an inner citadel to protect the vital power plants. The hulls will be formed of triple steel "skins," thus making them less vulnerable to mines and torpedoes.

A few days ago, residents of Philadelphia, Pa., heard the sound of heavy firing coming from down the Delaware River. At the League Island Navy Yard, experts were busy testing out these latest innovations in hull construction under actual battle conditions. High explosives,

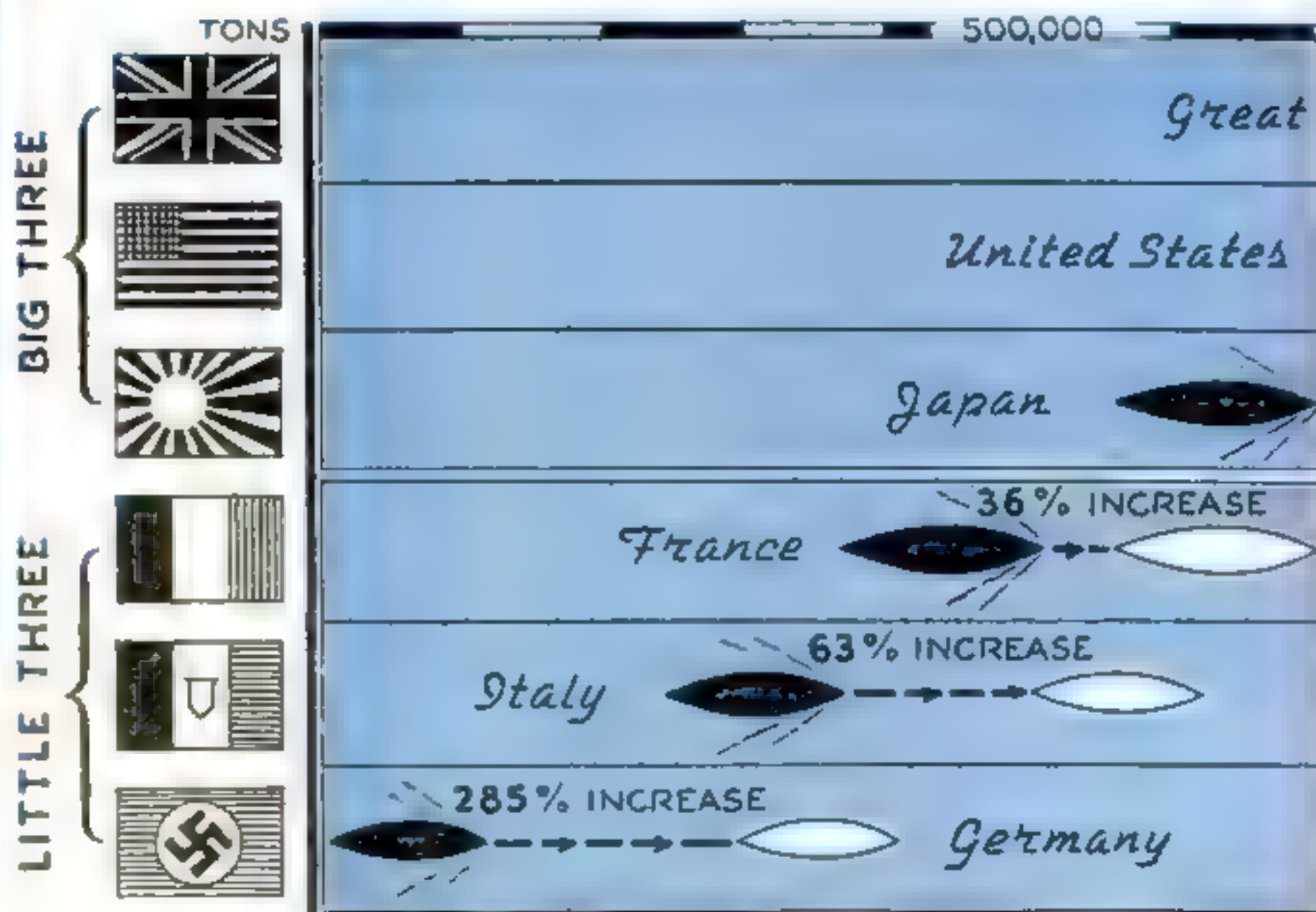
hurled against sections of such hulls, produced shocks comparable to those resulting from the detonation of torpedoes and mines. Study of the resulting damage is giving experts data which will aid American sea fighters to win battles in time of war.

The problem which is confronting naval architects today is how to make the latest ships proof against bombs from above and torpedoes from below, as well as from gunfire on the surface.



How proposed 45,000-ton battleships compare with the 35,000-ton "Washington" and "North Carolina" now under construction, and with the last battleship to be launched for the U. S. Navy, the fifteen-year-old "West Virginia"

## HOW THE LEADING SEA POWERS OF THE





Future dreadnoughts will probably be floating fortresses, armor-plated both above and below decks. An indication of how far vessels of the future may go in this direction is found in the latest French battleship, the *Dunkerque*. Heavy steel armor makes up 10,000 of its 26,500 tons—about forty percent of its total weight.

Most of the advances in design which will characterize new additions to the American fleet are being worked out with models in the miniature oceans of the marine testing laboratories at the Washington Navy Yard. Here, rowboat-size battleships of wood are constructed exactly to scale, smoothed by great mechanical planes, and towed through the water while delicate gauges and meters record data which reveals just how the full-size fighting craft will behave in heavy winds, rough water, and the varying conditions met at sea.

For work of this kind, the largest naval laboratory in the world is under construction at Carderock, Md., ten miles from Washington, D. C. In designing the precision instruments and apparatus for this \$3,000,000 plant, every precaution is being taken to prevent minute errors which would be magnified into great ones in the full-size men-of-war. The rails which will carry the models down the 960-foot high-speed tank, for example, will be bowed upward ever so slightly to allow for the curvature of the earth!

What is learned at Carderock and elsewhere will be applied at the shipyards where the clang of sledges and the metallic roar of riveting hammers will continue for years before all the ships planned have been completed. Two 35,000-ton dreadnoughts, to be named the *Washington* and the *North Carolina*, are now under construction at Navy Yards in Philadelphia and New York City. Funds for four additional battleships have been provided



Silhouetted against a sunset sky, three units of our mighty fleet photographed on maneuvers form a peaceful picture that is belied by their bristling guns and heavy armor plate

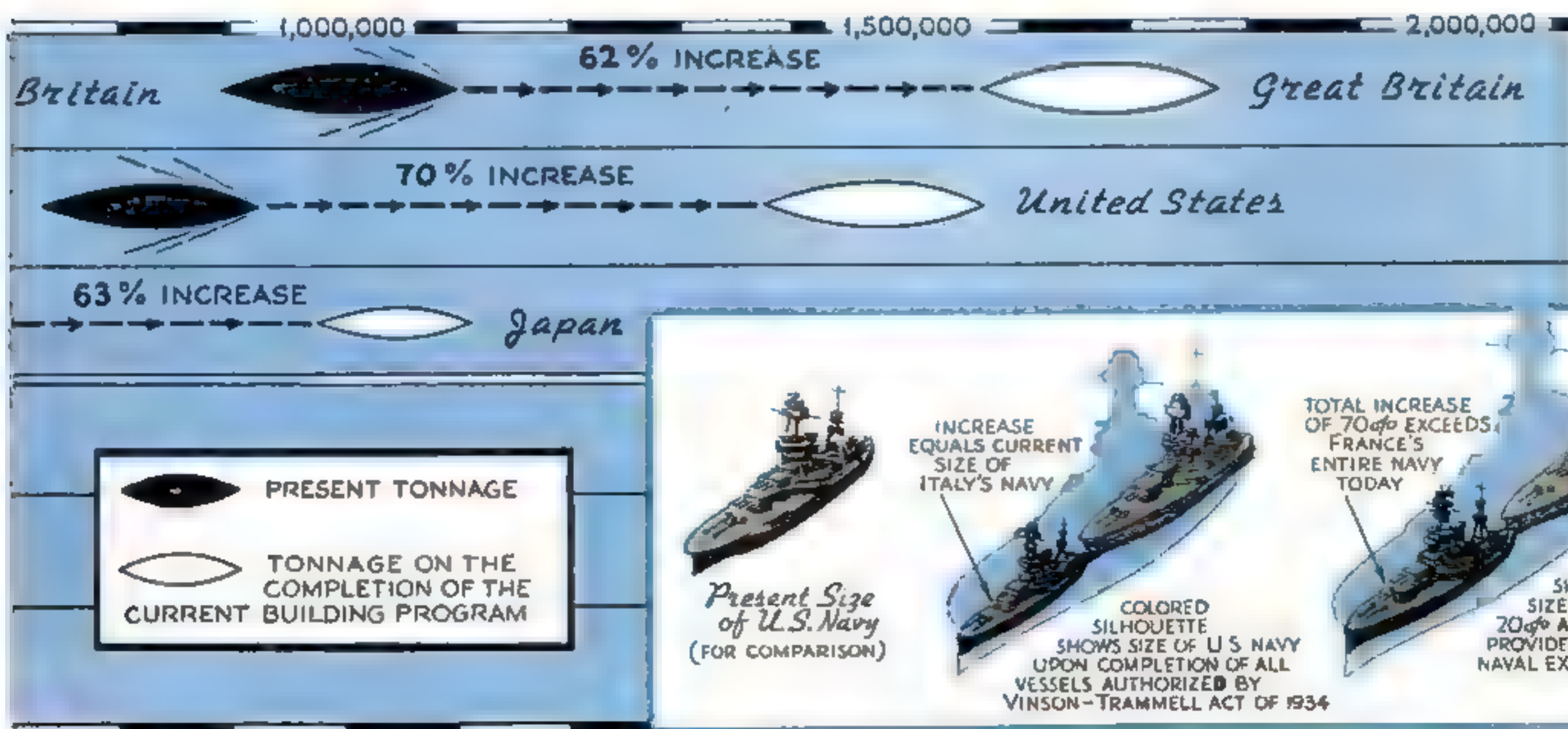
by Congress. And this does not include the three dreadnoughts of the latest \$1,000,000,000 program. America, today, is leading the world in battleship construction. The total tonnage planned will run from 315,000 to 345,000 tons. According to unofficial information, Great Britain is building five battleships, totaling 175,000 tons; Germany five battleships, totaling 157,000 tons; Japan capital ships that total 138,000 tons. Rumors that Japan has under construction three 46,000-ton superdreadnoughts have not been confirmed.

The advance guard of Uncle Sam's new fleet, the two vessels under construction at Philadelphia and New

York, will be the first battleships laid down in the United States since the half-completed *Washington* was used as a target for aerial bombs in 1924. In the fourteen years that have intervened, the airplane has come of age as a fighting machine. So the new ships will be the first designed by American naval men to include safeguards against high explosives rained down from the sky.

At the opposite extreme from these armored giants are the swift, torpedo-carrying "mosquito boats" with which the United States Navy has just begun to experiment. Driven by Diesel engines and armored against machine-gun bullets, (Continued on page 100)

## WORLD LINE UP IN THE GREATEST NAVAL BUILDING RACE IN HISTORY



If the naval expansion program is carried out, the increase in our present navy will exceed the total strength of France today, as shown below





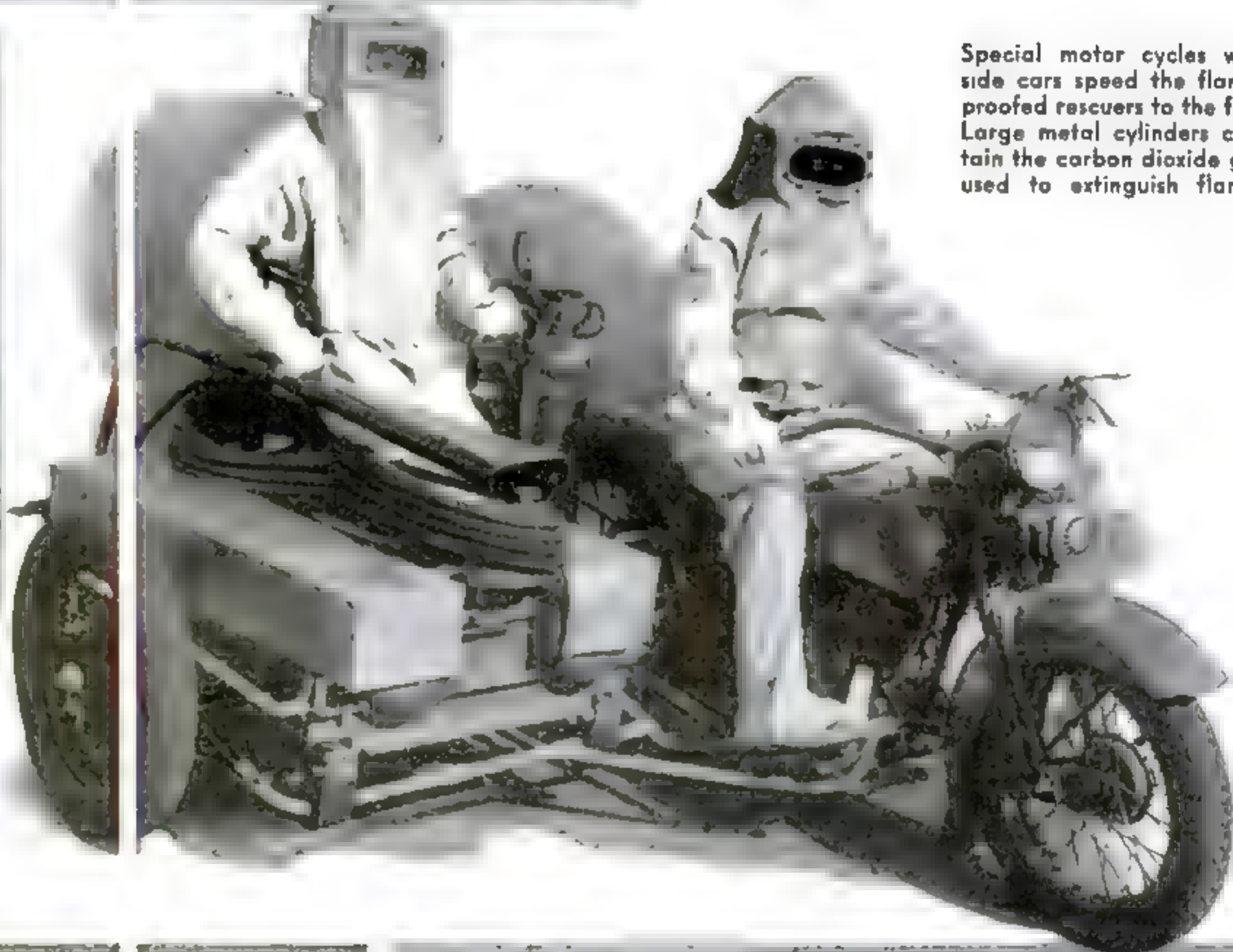
# Airport

**ASBESTOS-CLAD RESCUERS  
IN A REALISTIC DRILL SHOW  
HOW THEY SAVE A TRAPPED  
PILOT FROM A BURNING PLANE**

• • •



When the fire siren at New York's Floyd Bennett Airport screams its warning that a plane is in flames, trained rescuers rush to their posts and don their asbestos suits



Special motor cycles with side cars speed the flame-proofed rescuers to the fire. Large metal cylinders contain the carbon dioxide gas used to extinguish flames



Responding to the call with the fire fighters, an ambulance stands by as the asbestos-clad smoke eaters enter the "inferno" to rescue the trapped aviator

Fixed to the belt of each suit, a steel safety cable, visible in the photograph at the right, is used to pull a rescuer out of the flames should he be overcome by the smoke and the heat or be injured





# Fire Fighters

**A**T FLOYD BENNETT Airport in New York City, airport workers recently propped up a sport plane on its nose. One of them jammed himself in the cockpit, as if wedged there by a crash. A sky-writing plane, grounded near-by, enveloped the "wreck" in smoke. The airport's fire siren screamed.

It was a fire drill, staged without warning, for one of the world's most modern rescue squads. In the past, rescuers have sometimes been helpless to penetrate an

inferno of blazing gasoline and save the pilot of a cracked-up plane from burning to death. What happens today was demonstrated by asbestos-clad men who came racing across the field on motor cycles, trucks, and ambulances.

Converging on the "burning" plane, they leaped into action. While some sprayed carbon dioxide snow from fire extinguishers, others groped through the realistic smoke to the "pilot," who was extricated and borne to an ambulance in less than sixty seconds. Within ten minutes the "fire" was out, the asbestos suits were back on their hangers, and every one was back at his regular station.



From the control tower, a red searchlight is flashed at approaching planes to warn them not to land



Ready for fire duty. The funnel-shaped nozzle on the hose sprays carbon dioxide snow to smother the flames

Sixty seconds after their arrival, the fire fighters carry the pilot from the cabin of his "burning" plane



Placed on an emergency stretcher, the "injured" pilot is put in the waiting ambulance and rushed to a hospital. During the rescue, a fireman, "overcome" by the smoke has been dragged out of the flames to safety by means of the steel cable fastened to the belt of his flameproof suit



The "fire" is out, the drill is over, and the fire fighters' asbestos suits are hung up again. Only ten minutes have elapsed since the fire call





## Porpoises Are Pets in Giant Aquarium

TAME porpoises are among the many sea denizens housed in the new giant aquarium near St. Augustine, Fla. (P. S. M., Apr. '38, p. 43), now open to visitors. The Florida miniature ocean contains two of these curious deep-sea mammals, which are said to be the only porpoises in captivity anywhere in the world. In the photograph, Curator Arthur McBride is shown feeding a mullet to one of his porpoise charges.

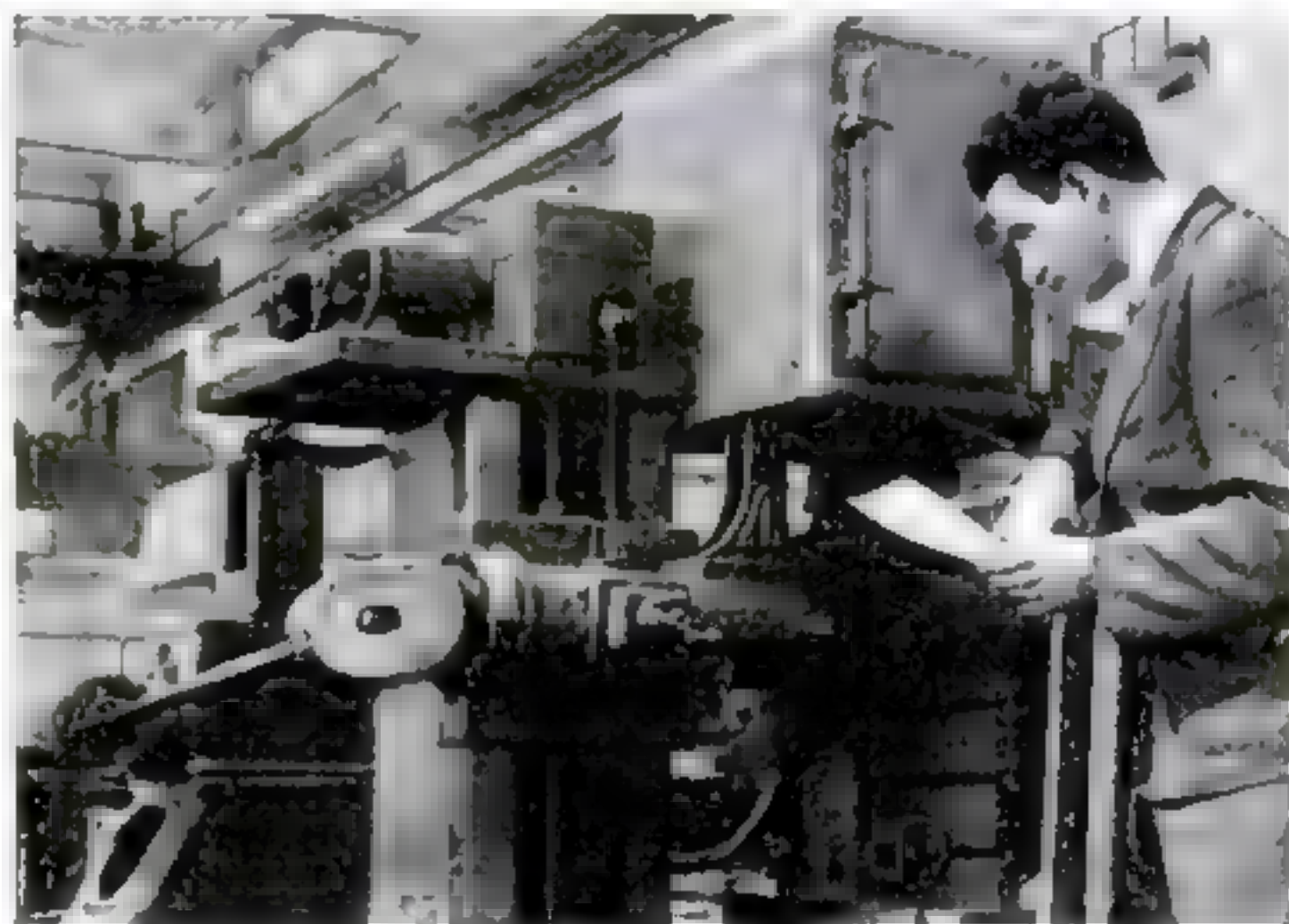


## Pads Hold Sun-Tan Oil in Convenient Form

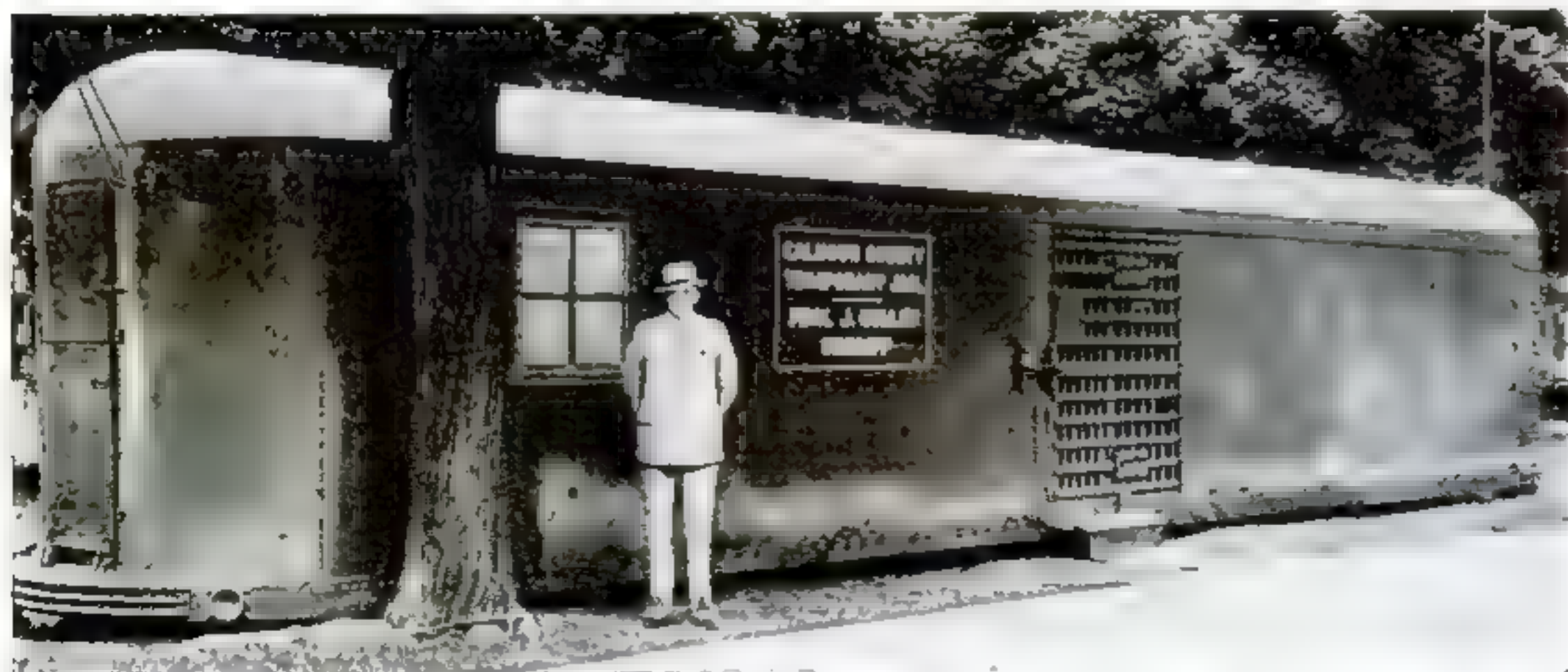
FLANNEL pads impregnated with a high-quality vegetable oil are now available to sun-bathers as a means of applying a protective coating to the skin. Each disk contains more than half an ounce of the protective oil, sufficient to coat the entire body from head to foot.

## Device Reads Drawings To Make Metal Parts

OPERATED by a photo-electric scanning device, an ingenious milling machine invented by a Russian engineer is said to produce metal parts by automatically following scale drawing placed within it. Tests made on an experimental model, it is claimed have proved that the unit both shortens the time previously required for machining and produces extremely accurate work.



Automatic milling machine and its Russian inventor, V. Vikhman



Lawbreakers in Calhoun County, Mich., were confined in this steel car on the courthouse lawn at Marshall

## Violin Built Like Seismograph

WATCHING a seismograph recording an earthquake gave Dr. Hugo Benioff, Pasadena, Calif., scientist, the idea for a new type of violin whose tone is said to have astounded musicians by reason of its depth, volume, and clarity. Knowing that both earthquakes and music consist of vibrations, Dr. Benioff modeled his violin on seismographic principles, producing an instrument with aluminum containers placed below the strings to replace the wood-inclosed air chamber that gives resonance to the conventional violin. The novel earthquake fiddle, shown in the photograph being played by its inventor, dispenses with the usual wood backing, making it possible to look right through the instrument.



Dr. Hugo Benioff playing a melody on his "earthquake" fiddle

## Railroad Car Is Temporary Jail

WHILE the county jail at Marshall, Mich., was being renovated and remodeled, Sheriff Perl J. Kellay purchased an abandoned inter-urban railroad car for use as a temporary lockup. Fitted with heavy metal doors and bars, the steel railroad car was stripped of its wheels and undercarriage, and moved onto the courthouse lawn, where it served as the Calhoun County cooler until remodeling of the regular jail had been completed.



This machine drives wire staples through heavy sheets of metal to hold them together



## "Sewing Machine" Stitches Metal

USING wire instead of thread, the "sewing machine" pictured above stitches together sheets of metal. The wire unrolls from a spool and passes into the machine, where it is cut and formed into staples which are driven through the metal sheets and clinched together.

## Dress Form Is Molded on the Body



Plastic material spread over a light-fitting garment to harden. At right, dress form in use

PERFECT fit is assured when dresses are draped on a "carbon-copy" dress form now available to women who make their own clothes. Molded on the purchaser's own figure, the form is made by applying cloth and a plastic and allowing it to harden. It is then split, removed, and mounted on a metal stand



## Folding Cottage for Campers Rides on Car Roof



SUPPORTED on the roof of an automobile with the aid of a metal frame, a collapsible house designed for tourists, campers, and sportsmen can be swung down to ground level, unfolded, and set up within ten minutes. Four walls, hinged to a wood floor held six inches above the ground, are lifted up and locked into position. The roof is then placed over the structure, which measures six by nine feet, has a head clearance of over six feet, and provides sleeping and eating accommodations for four persons. The portable cottage has six windows fitted with sliding glass panes and permanent screens. When the house is collapsed, there is ample storage space inside to carry bedding, cooking equipment, and other necessities. Supporting legs of the floor are adjustable to allow for irregularities in the ground.

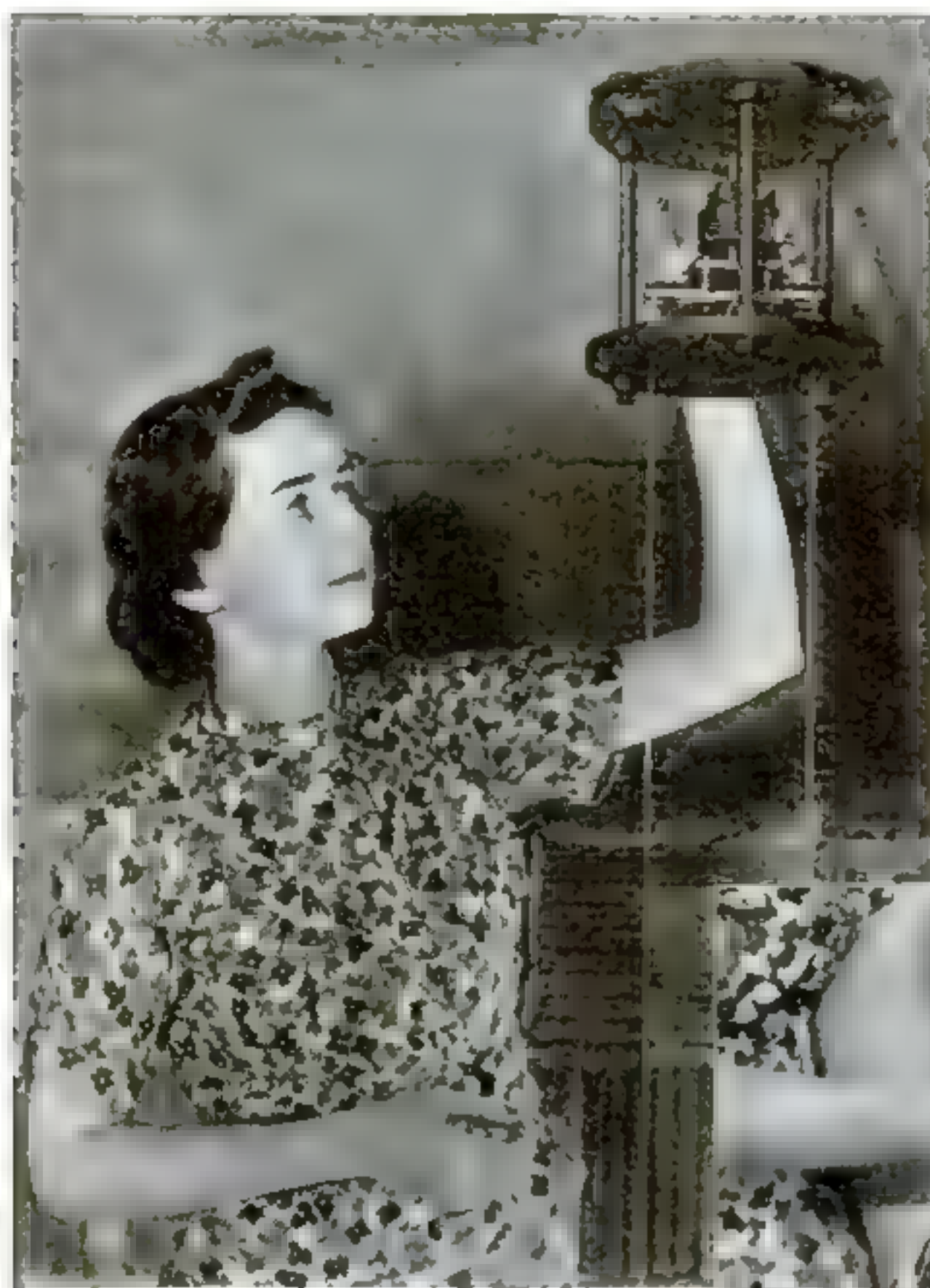


Pickaback trailer on the road. The view at upper left shows how the floor and walls are lowered from the car top. At left, interior at mealtime with four at table. Below, exterior of the cottage



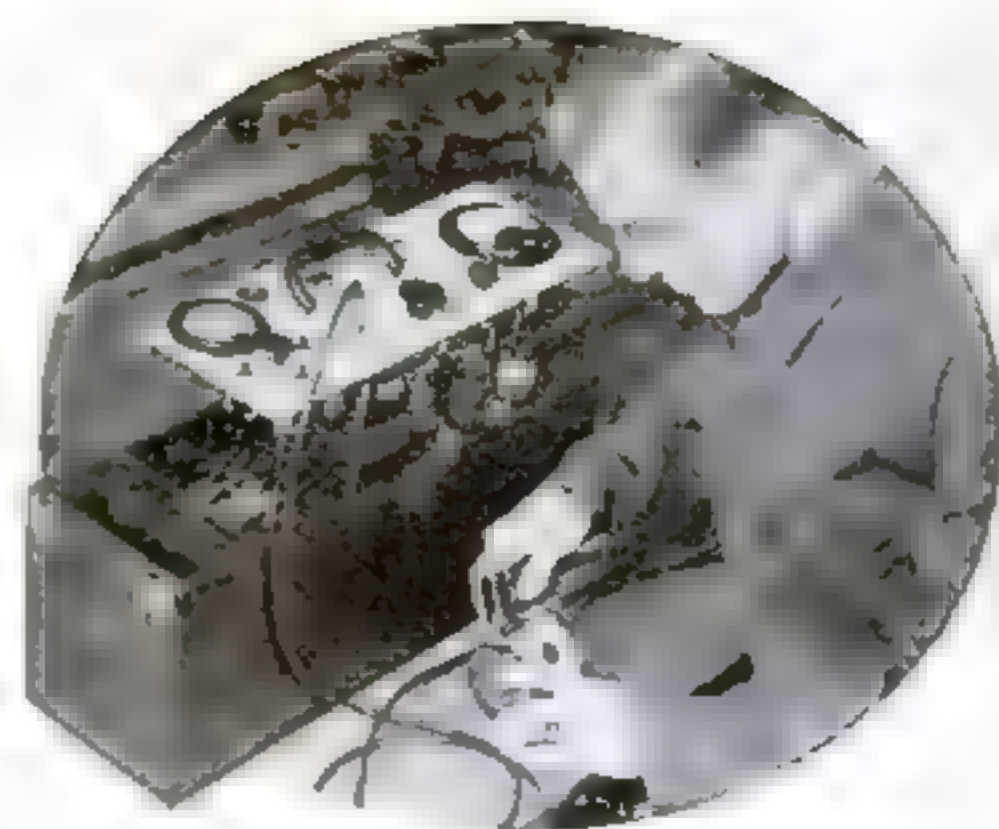


## Big Pendulum Checks Changes in Gravity



Hung from the top of an abandoned nine-story elevator shaft, the pendulum being set in motion at right measures gravity

To obtain an accurate record of the variations in the force of gravity at Chicago, Ill., scientists have rigged a giant pendulum, 120 feet long, in an unused elevator shaft. An electric spark jumps a gap as the pendulum passes a fixed point in each swing. The spark perforates a moving strip of paper, making a record of the intervals from which the pull of gravity can be calculated. To avoid spinning, the pendulum is started by burning through a supporting cord as shown below. A thirty-pound, chromium-plated ball provides the weight for the pendulum.



## Electric Feeler Tests Surface Smoothness

DEPTH of surface irregularities in metals, glass, and other materials are accurately measured by an extremely sensitive electrical instrument just invented. Battery-operated, the apparatus employs a tracing unit fitted with a diamond-pointed needle. Passed over the surface of a material, the needle dips into depressions whose depth can only be reckoned in units of less than one millionth of an inch. An intricate electrical mechanism then records the size of the depressions, automatically determining the average irregularity of the surface being tested. In the illustration above, an engineer is shown measuring the surface irregularities of the piston of a gasoline motor.



Surface variations are "felt" by a diamond set in a special hand tool. Top, the device in use

## Pressure on Toy Bus Winds Up Its Motor



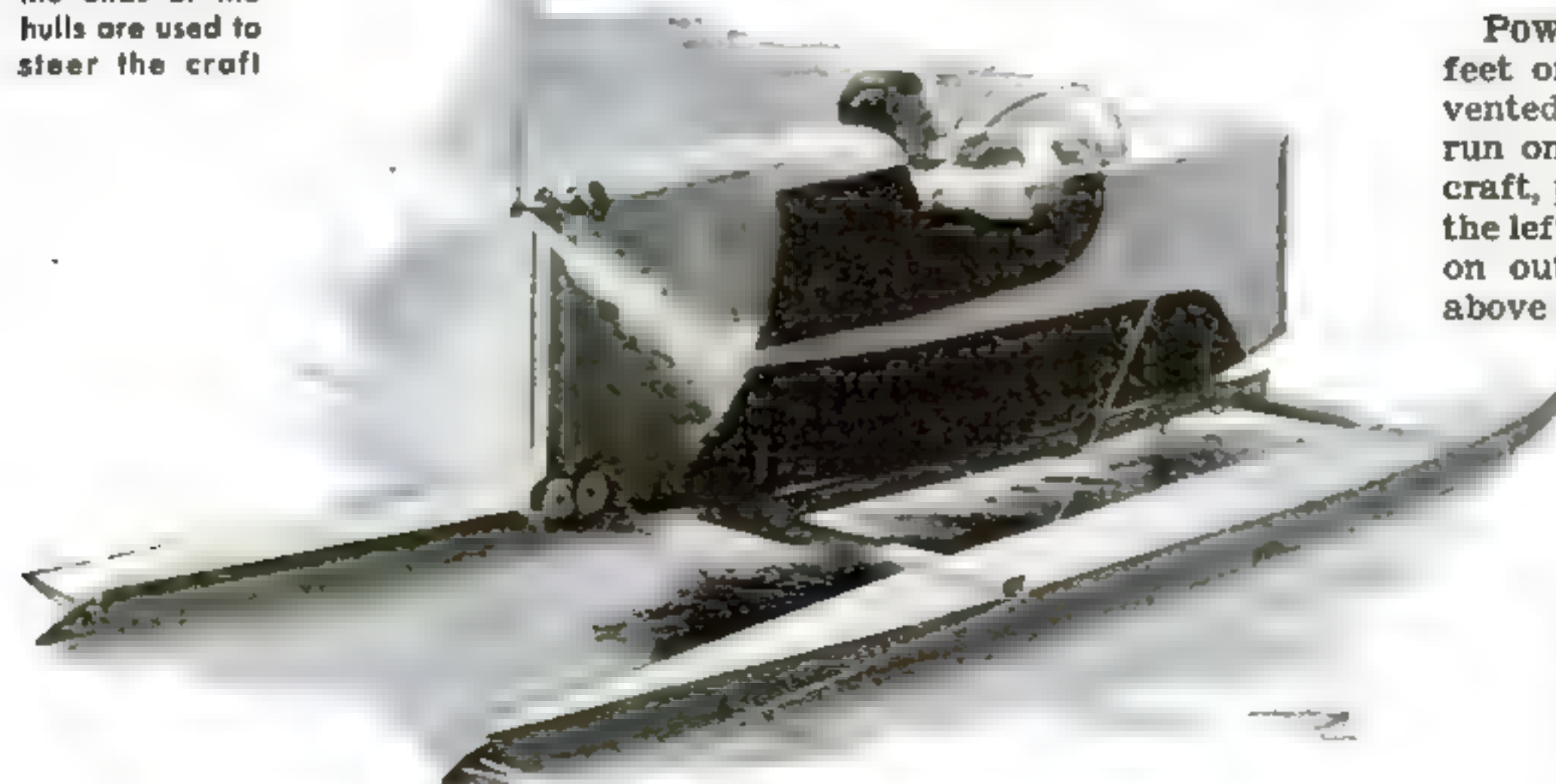
Toy bus being wound up by pressing down on its roof

BUILT to resemble the streamline busses now in use on the streets of many cities, a novel toy bus recently placed on the market is powered with an easily wound spring motor. To start the toy vehicle moving, a child merely presses down on the rear, as shown at the left, and then lets go. The bus will travel over a level surface for a considerable distance before stopping.

Small rudders at the ends of the hulls are used to steer the craft

## Foot-Powered Propeller Drives Twin-Hull Boat

POWERED by an air propeller operated by the feet of its pilot, a novel twin-hulled craft invented by an Italian was recently given a trial run on the Tiber River at Rome. The unusual craft, pictured in the photograph reproduced at the left, has a streamline cockpit that is mounted on outrigger pontoons to raise the propeller above the level of the water.



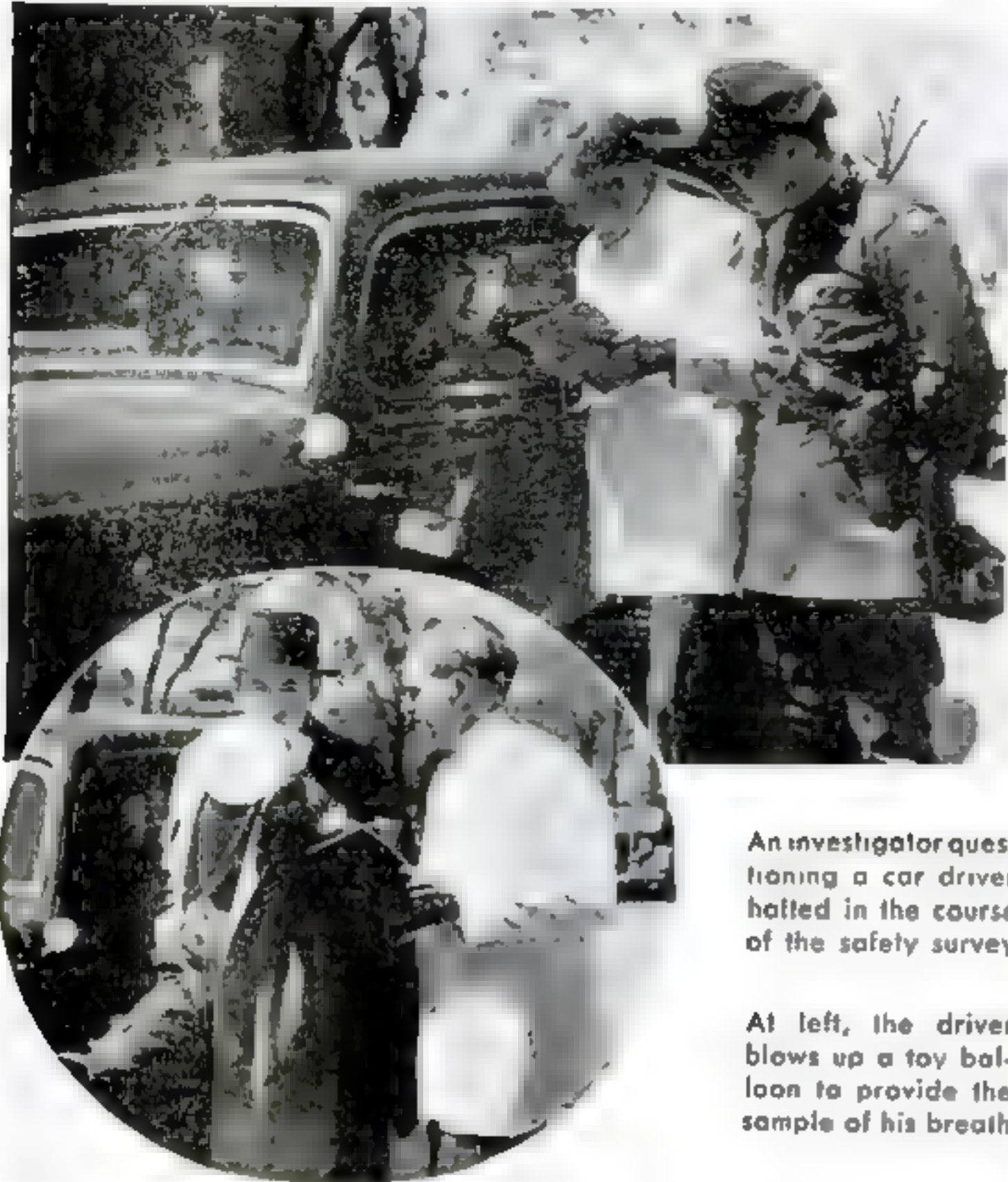
## Paperless Cigarette Has Tobacco Wrapper

CIGARETTES rolled not in paper but in a thin transparent material made of the tobacco itself are now possible. Two Hungarian inventors are reported to have perfected machinery for making the paperless cigarettes in quantity.



## Toy Balloons Sample Drivers' Breaths

MORE automobile drivers are under the influence of alcohol—or, at least, have been drinking—between three and four o'clock on Sunday morning than at any other time of the week, according to the results of a survey conducted by the Traffic Safety Institute of Northwestern University, Evanston, Ill. Two thousand motorists were halted at all hours of the day and night, and each was requested to blow up a toy balloon to provide a sample of his breath for careful test.



An investigator questioning a car driver halted in the course of the safety survey

At left, the driver blows up a toy balloon to provide the sample of his breath



## Movies Check Antiaircraft Fire

RESULTS of antiaircraft target practice are checked accurately with the aid of a motion-picture device employed by the Coast Artillery Corps of the U. S. Army. As guns are fired, the spotting motion-picture camera takes high-speed photographs of bursting shells for later projection in slow motion. In the photograph above, an officer is photographing antiaircraft practice on targets towed by U. S. Army planes.

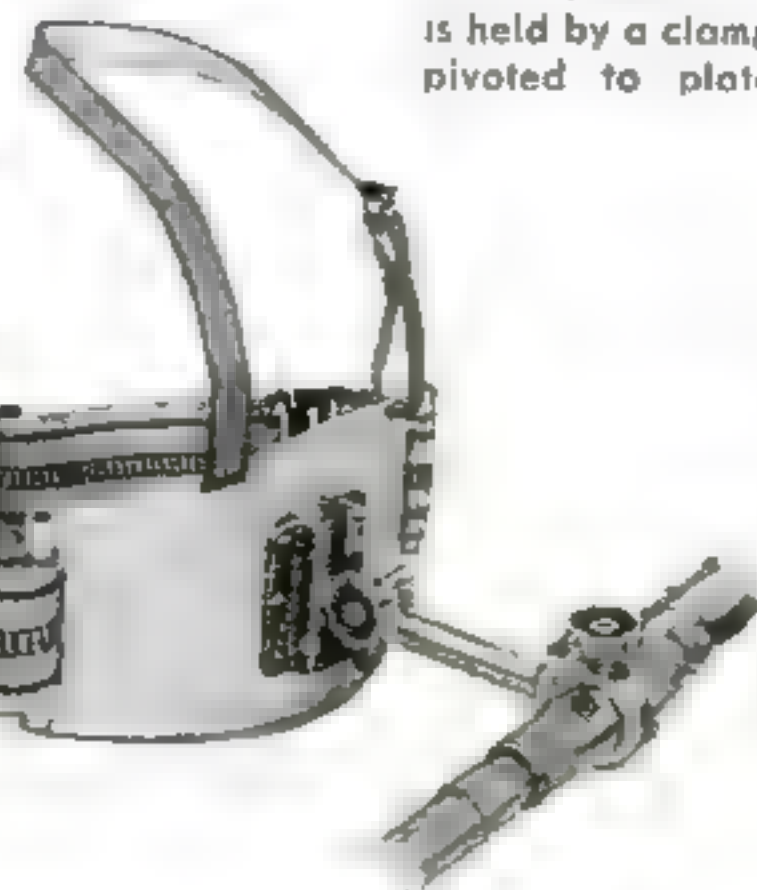
## Machinist's Breastplate Holds Power Tools

DESIGNED for holding powered hand tools, the mechanic's breastplate illustrated below transfers the strain from the operator's arms to his body. Securely

harnessed to the worker's body by back and neck straps, the curved metal plate can be attached to any power tool with the use of a short bolt fitted with a circular clamp and thumbscrew. This bolt is fastened to the breastplate by means of a hinge and can be locked rigidly in place at any angle convenient for the work. The device enables a machinist to use the greater strength of his body in applying pressure to the tool he is using, while leaving his hands free to guide the work.



The breastplate in use. It allows greater pressure to be applied to the tool, and frees hands

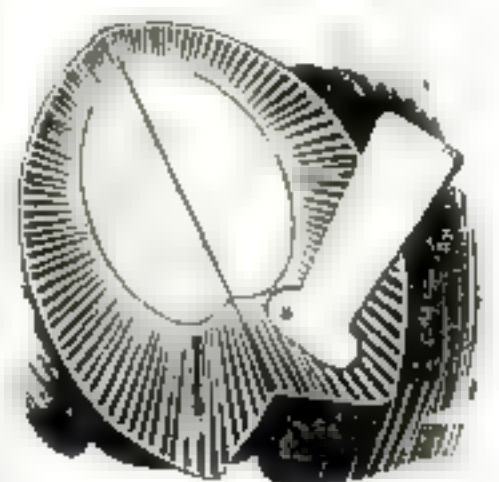


How a power tool is held by a clamp pivoted to plate



## Fan Folds for Pocket

A HANDY cardboard fan designed to be given away as an advertisement folds compactly enough to fit into a man's coat pocket or a woman's handbag. Roughly circular when opened out, the device has a pivoted handle that fits into a slot to hold the fan open when it is in use, as illustrated above. The drawing at right shows the method of folding the fan, the blade folding up the middle and the handle turning inside it.



Fan folded for carrying in the pocket

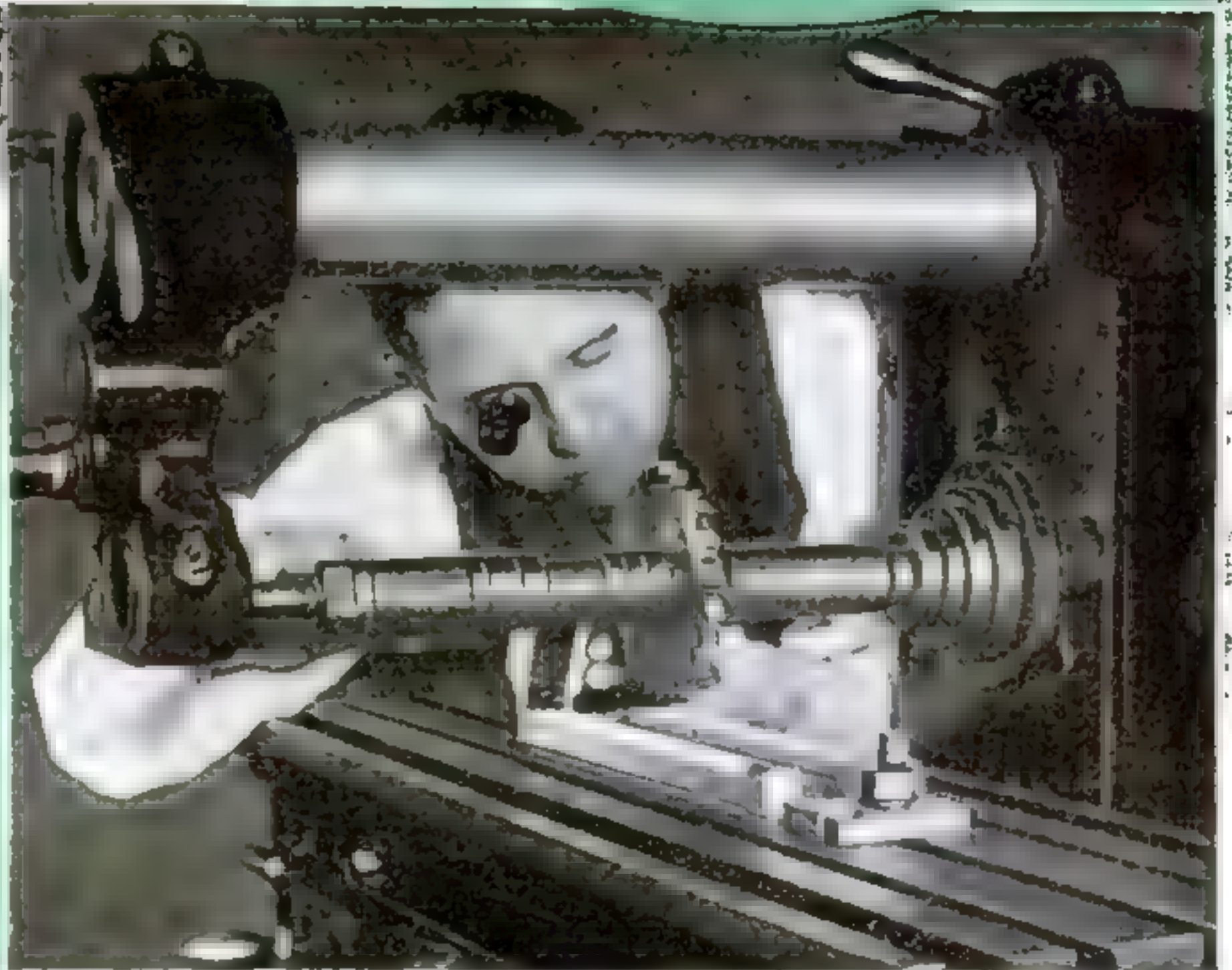




Alexander C. Parlino (standing) consulting with a member of his staff on the details of an invention. At right, he is at a milling machine, using a jeweler's glass for greater precision

# Inventor FOR HIRE

BY  
EDWIN TRALL



IN THE fall of 1922, a young mechanic named Alexander Parlino found himself stranded in California. While he hunted work, he tried living on a diet of the cheapest food in sight—oranges. Peeling the fruit in sufficient quantities to satisfy his healthy appetite proved a bit of a chore, so he riveted a handle to a shoehorn, making a peeler that removed the skins quickly. Later on, when he found a job, he patented the idea.

That simple device was Parlino's first invention, and it started him on the road to a unique career. Today, he is known as "the man who invents inventions for inventors." In his laboratory, in New York City, he has helped more than 500 men and women to turn bright ideas into workable machines. Even such world-famous inventors as Nikola Tesla and Beulah Louise Henry, the "lady Edison" who holds more patents than any other woman in the world,

are numbered among Parlino's clients.

To begin at the beginning of his remarkable story, we have to go back to 1908. In that year, his parents brought him to America from his birthplace, Florence, Italy. His father, a mechanical engineer, settled in New York City, where young Alexander attended public school. At the age of fifteen, his formal education ended. He became an apprentice in a machine shop where electrical instruments were turned out for the U. S. Navy. His first job was to sweep out the factory, but it wasn't long before he was given more and more responsible work. At the end of three years he was able to obtain a place doing precision work for a manufacturer of microscopes.

In the decade that followed, Parlino added to his practical experience in mechanics by working at the Bell Telephone Laboratories, in New York City; with an inventor of mo-

tion-picture equipment, in Hollywood, Calif.; with a manufacturer of sugar-refining machinery, in Salt Lake City, Utah; and, finally, as engineer in charge of research and development at one of America's largest hosiery plants.

Although he never had the opportunity to go to college, Parlino studied nights and piled up enough credits to qualify him for membership in the American Society of Mechanical Engineers. Also, during these roving years, an idea had been taking shape in his mind. It was a plan for a unique laboratory, a workshop where inventors without mechanical training or facilities for developing their ideas into workable form could come for help.

With the arrival of the depression, in 1930, Parlino, like thousands of other capable men, found his job swept from under him. He decided to put his plan to the test. Gathering around him several expert mechanics with a bent for inventing, he took space in a downtown New York City building and started the Empire State Laboratories.

The sign on the door says: "Inven-



This patented orange peeler started Parlino on his career as an inventor. Living on oranges while stranded in California, he made the original model from a shoehorn



tions Developed. Models Constructed." It might as well read: "Expert Inventors for Hire. Two Dollars an Hour." That is the flat fee at the laboratory. Parlini, who is solidly built and of medium height, first discusses an idea with a client to see if it is mechanically practical. He is courteous, soft-spoken, and tremendously interested in his work. If the idea is sound, he will undertake its development; otherwise not. Oftentimes, people bring in little more than the bare idea of an invention and Parlini does the rest.

A few years ago, a woman came to the laboratory with a piece of canvas in which she had made some unusual stitches with a needle and thread. She wanted a sewing machine designed to stitch just that way! Parlini set to work. When the mechanism was completed, heavy fabric passed through it twice as fast as through any other sewing machine on the market. A manufacturer of overalls wrote out a check for \$25,000 just to obtain an option on the machine. The bill that Parlini sent the woman for perfecting the mechanism was less than \$3,000!

On another occasion, a client arrived with little more than a hunch. There were crying dolls, sleeping dolls, talking dolls, he said, so why wouldn't there be a big sale for a laughing doll? Starting almost from scratch, Parlini worked



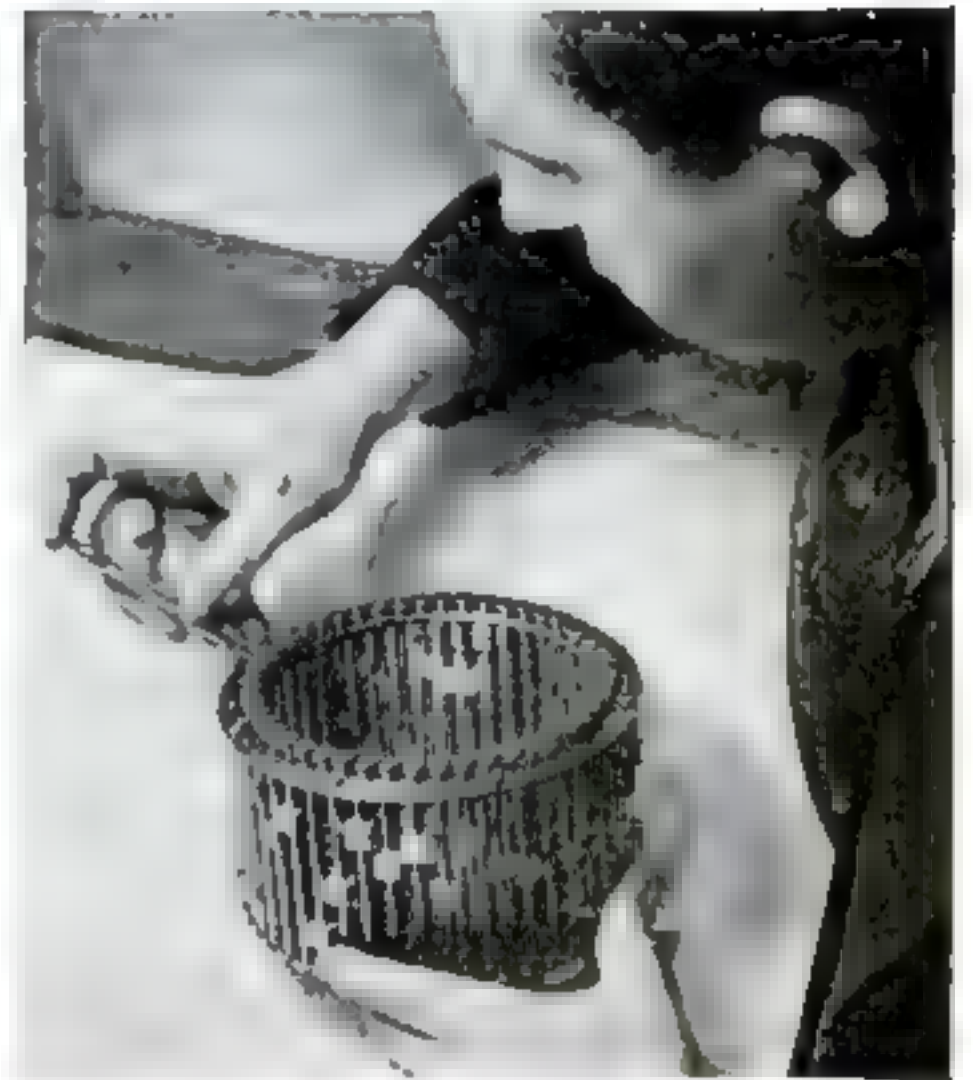
For fun, Parlini invents photographic devices and tries them out on his associates. In the picture at the right, he works on an automatic radio tuner

out the desired novelty item and it had a widespread sale. The development work cost the originator of the idea only \$500.

The average cost for developing a small device is around \$150. The cheapest job on the laboratory books came to fifteen dollars. Machines run close to \$1,500 and automatic machines to \$2,500. There is no charge for the initial visit during which the idea is discussed. Original ideas contributed by Parlini and his associates are free. The only charge in addition to the flat hourly fee is the cost of the material used

plus ten percent for handling. To protect clients, the date of disclosure is recorded and, when the work is done, all rights are assigned to the inventor.

A bore idea was all Parlini had to start with when he developed the laughing doll seen in action below

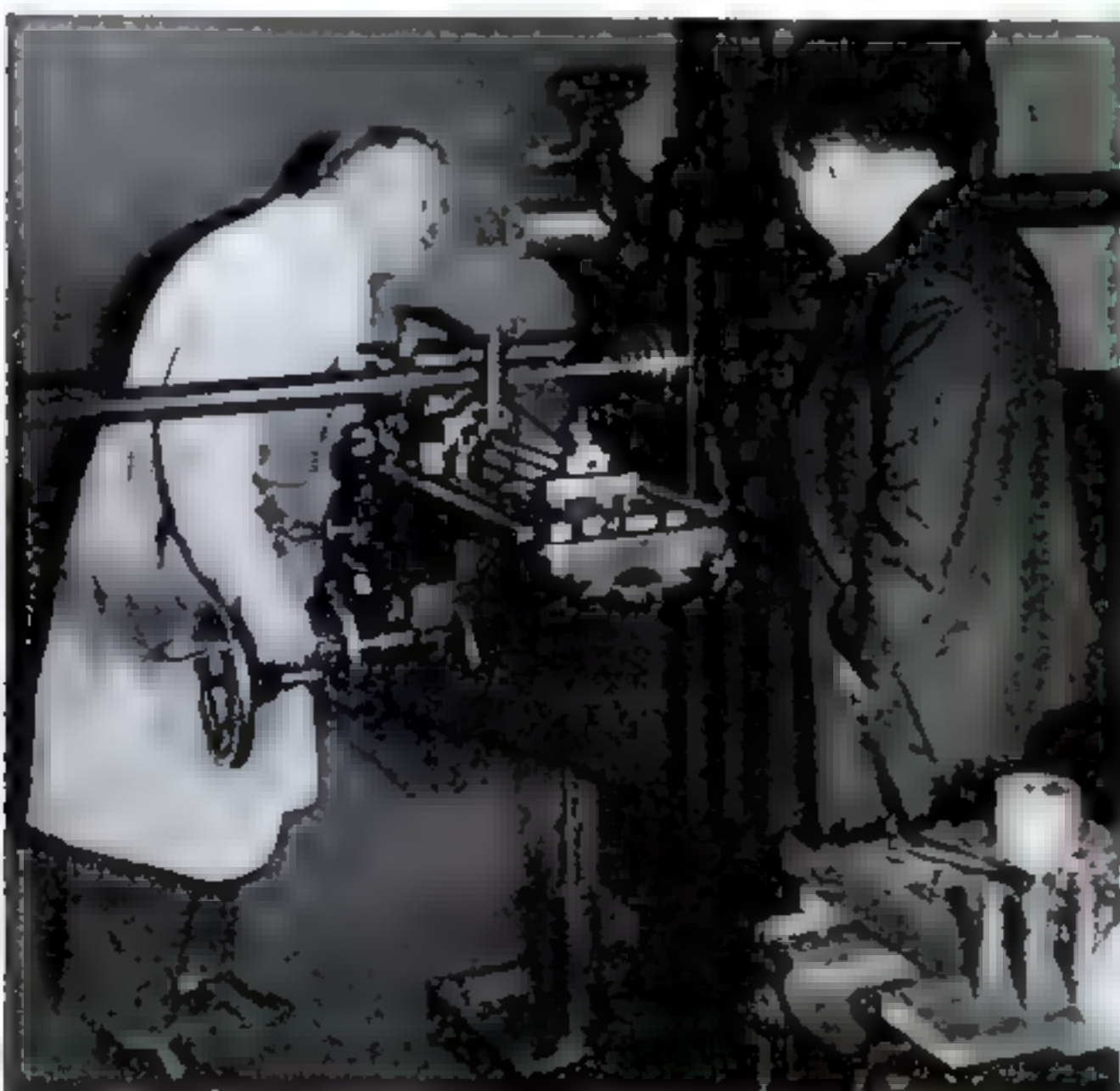


The laboratory retains no interest in the invention. It merely sells its services at an hourly rate.

As Parlini's reputation has spread, clients have come from farther and farther away. At present, the long-distance record is held by a man who journeyed all the way from England to obtain the assistance of the unique American workshop. At the other extreme is a client who walked down two flights of stairs from an office in the same building in which the laboratory is located. Several fertile-minded inventors have come in as many as seven or eight times, each time bringing a different idea to be developed.

One unusual repeat client is a doctor from Larchmont, N.Y. Because he is afflicted with sinus trouble, he has to avoid drafts. So, every time he buys a new car, he brings the dimensions of the front windows to Parlini and has him design a series of slanting glass vanes. They fill the window space at each side of the driver's seat and shunt the wind away from his head while providing adequate ventilation for the interior of the machine.

Only once since he opened the laboratory has (Continued on page 95)



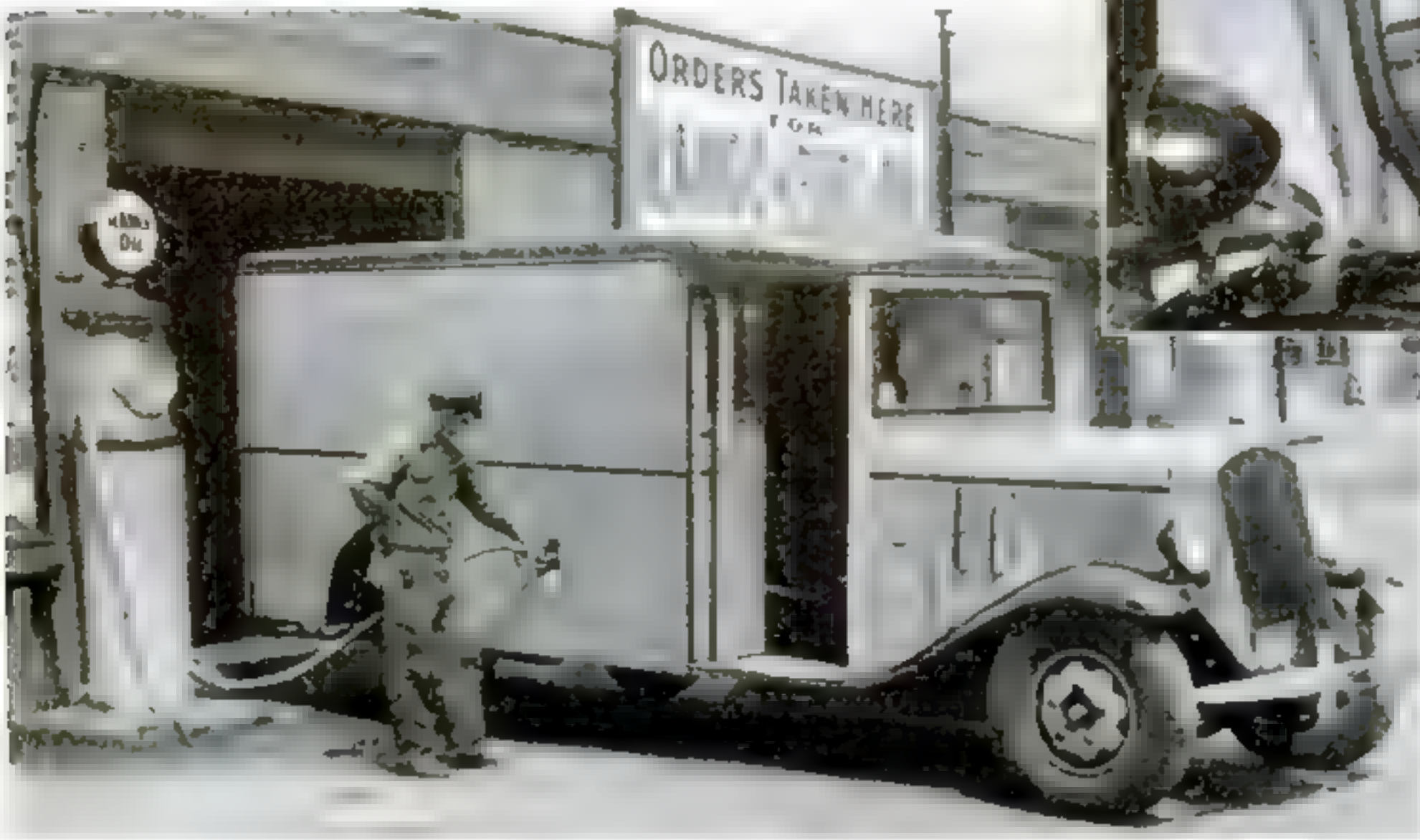
Here the "inventors' inventor" is watching a delicate piece of work. When details of design for an idea are settled, trained laboratory technicians make a model





# Steam Engine for Cars Burns Cheap Oil as Fuel

Is THE steam-powered automobile, popular in the early days of motoring, about to stage a comeback? That is the belief of two Newton, Mass., automotive engineers who have developed an experimental steamer equipped with a midget engine that runs sixteen miles on a gallon of seven-cent fuel oil. Speeds up to seventy-five miles an hour have been attained by their steam-driven vehicle.



Experimental steam-powered truck taking on fuel. It gets sixteen miles to the gallon



Steam boiler installed under a car hood. It requires no more space than a gasoline engine

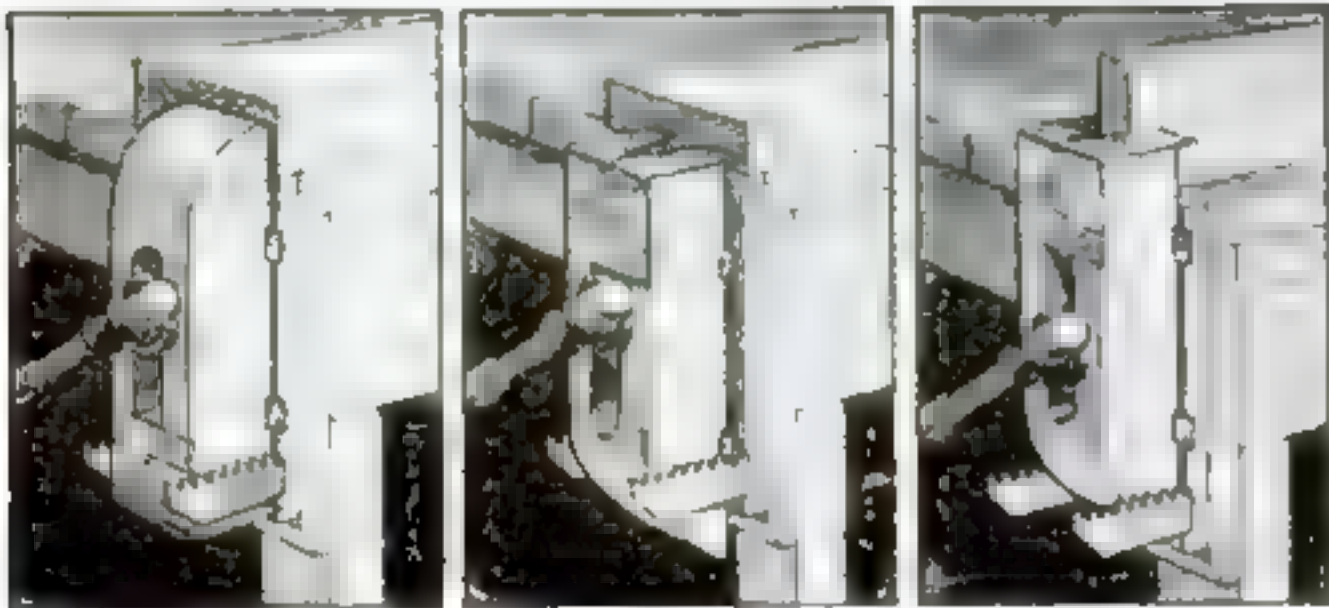
## Snuffer for Ash Trays

BY USING individual cigarette snuffers now available, any flat ash receptacle can be transformed into a butt-snuffing tray. Made of a molded plastic material, the tiny extinguishers have holes of the same diameter as a cigarette. When the end of a butt is placed in the hole, the burning tobacco is snuffed out in ten seconds.



These snuffers will go in any flat ash tray

## New Bench Attachment Is Three Tools in One

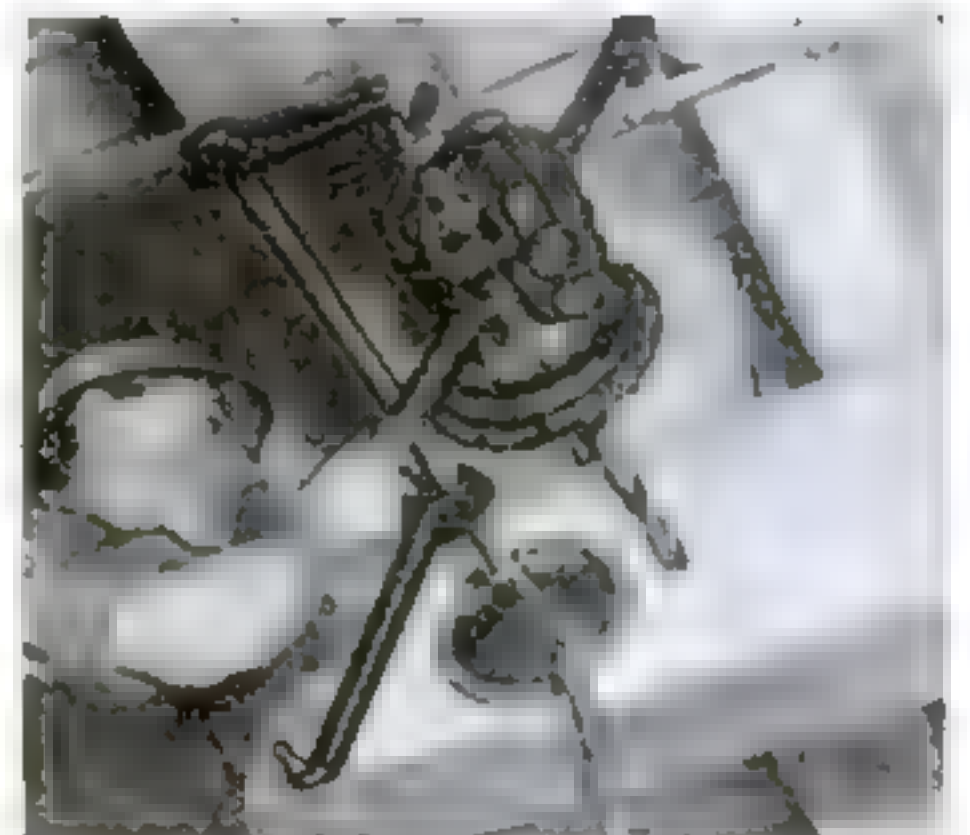


Three uses of bench tool as end stop. Right, the handy accessory being employed as a vise

VISE, bench stop, and clamp are combined in a handy tool now available for home-workshop enthusiasts. Attached to the end of a bench, the tool employs a reversible block, one end of which is smooth for use as a conventional vise, or as a stop when work is held flat. The other end has a V-shaped opening for holding work on edge, as shown at the right above.



## Suction Cup Supports Heavy Portable Tools



GIANT portable drills and other machine tools are now being held in place during operation by novel vacuum holders of the type illustrated above. The holding accessory is shown supporting a heavy drill solely by means of the high continuous vacuum within its cup-shaped base, which is connected by a rubber hose to a powerful, self-cooled vacuum pump.



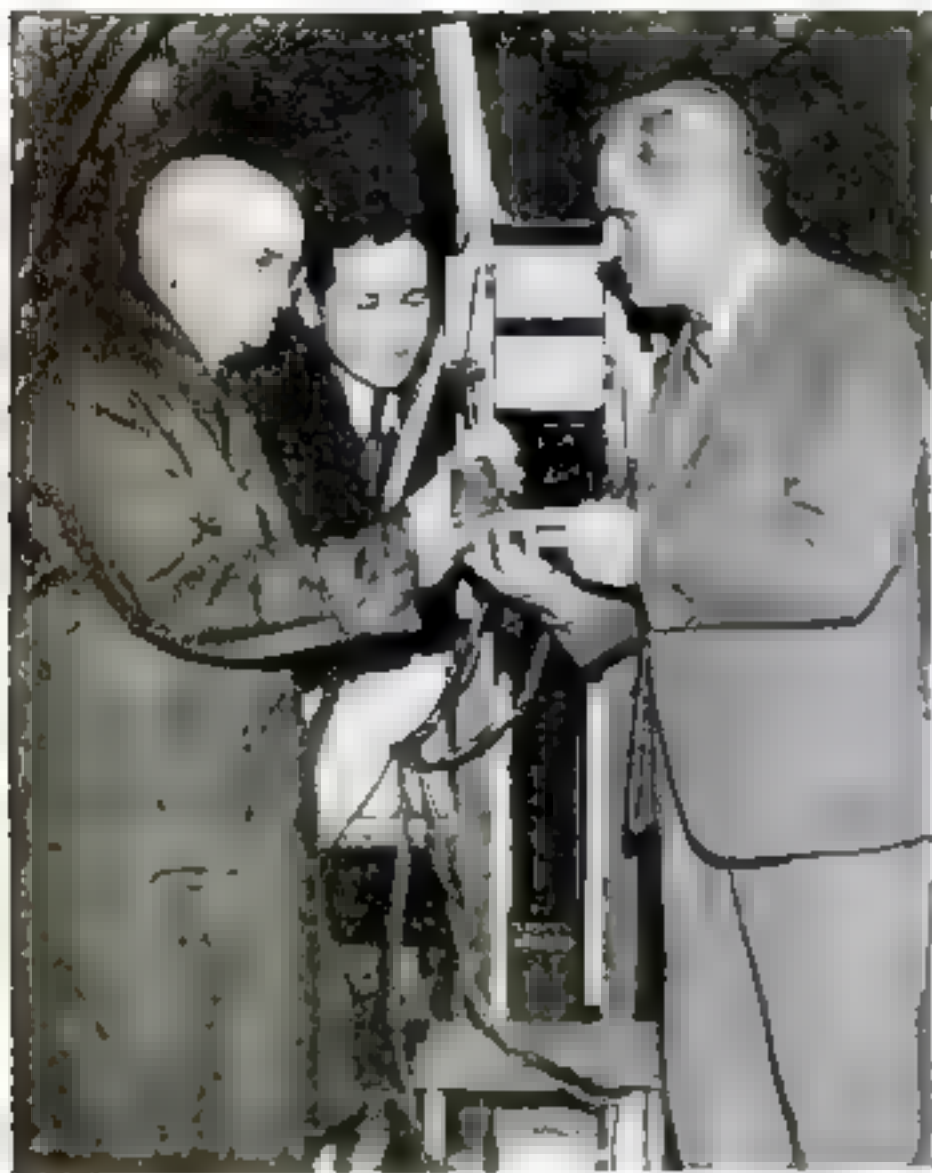
Automatic trouble-light switch mounted on car dash

## Trouble Lamp Lights When Hood Is Raised

AUTOMATICALLY flashing on when the hood is lifted, a light that clamps to the radiator supporting rod of an automobile is handy for examining the engine at night. Placed on the back of the dash, the unit's control switch is so constructed that raising either side of the hood releases a U-shaped piece of metal that turns on the light. When the hood is lowered in place, the light is turned out again.



## Tunnel Is Cosmic-Ray Laboratory



IN A tunnel under the streets of Chicago, Ill., experiments directed by Dr. Arthur H. Compton, University of Chicago physicist, have determined what type of cosmic rays, mysterious radiations from outer space, penetrate the fifty feet of solid rock above the tunnel. A special cosmic-ray telescope and recorder showed that the most prominent rays were barytons, a kind of matter unknown before cosmic-ray studies were started a few years ago.

Cosmic-ray recorder set up for use in tunnel

## Remote Control Grinds Big Valves

TWO THOUSAND times larger than those used in automobile engines, giant pump valves in the Colorado River aqueduct system are being ground by remote control. An electric switch regulates the grinding mechanism.



Workman operating a switch to control grinding of mammoth valve

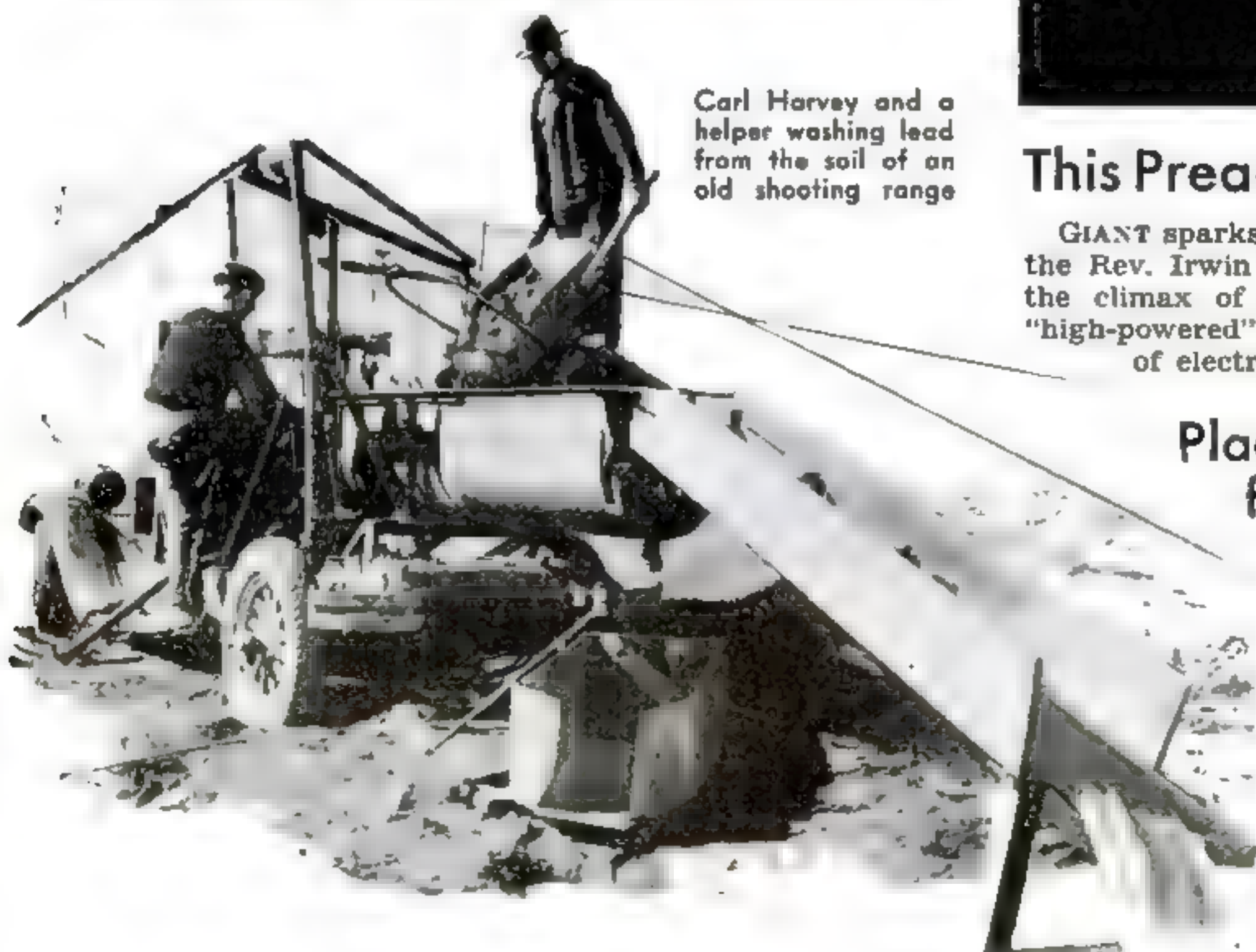


## This Preacher Makes the Sparks Fly

GIANT sparks crackle from the thimble-capped fingers of the Rev. Irwin Moon, a touring evangelist, as he reaches the climax of one of his "sermons from science." The "high-powered" preacher, shown above, uses \$10,000 worth of electrical equipment for his spectacular sermons.

## Placer Mining Recovers Lead from Old Target Ranges

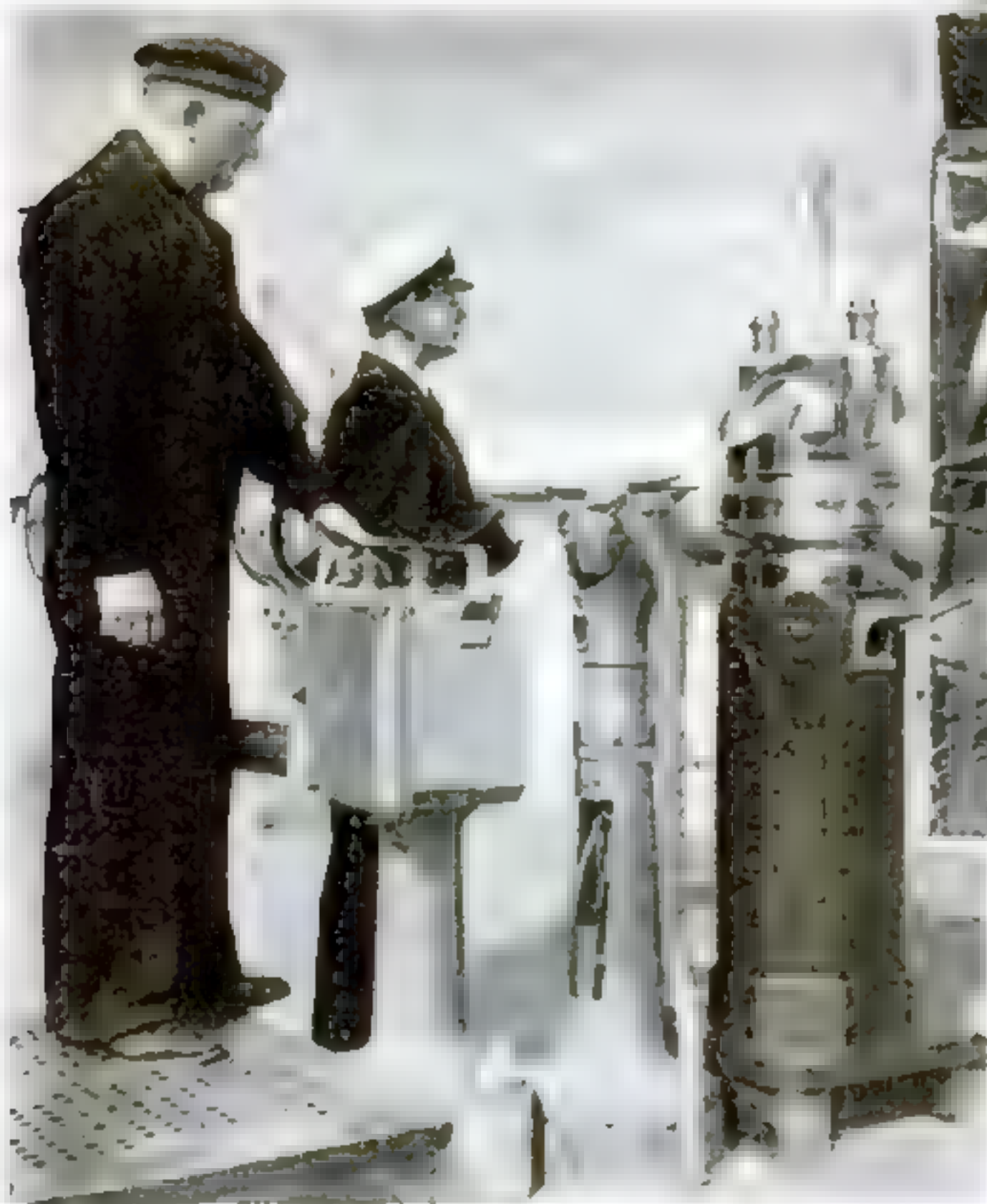
MINING lead on abandoned target ranges is the odd occupation of Carl Harvey, of Omaha, Nebr. With an old truck remodeled into a soil-washing apparatus, Harvey is seen at left "panning" the surface dirt from the grounds of the Sioux City, Iowa, Gun Club to reclaim lead pellets fired by members over a thirty-year period. Lead can be recovered at the rate of about five tons a day on some gun-club grounds, Harvey says.



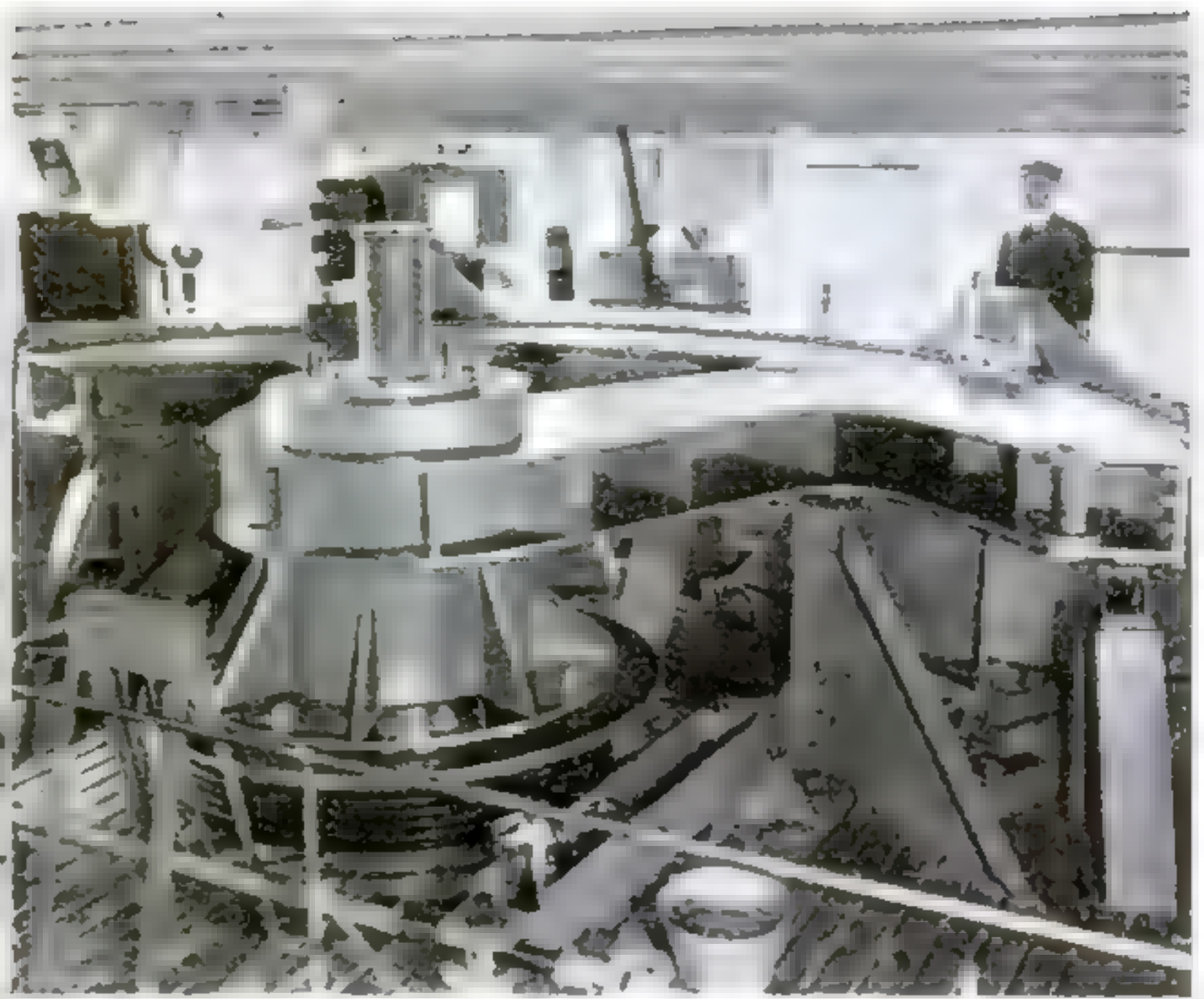
Carl Harvey and a helper washing lead from the soil of an old shooting range



## Buttons Replace Wheel To Steer Huge Liner



Steering by means of buttons on the bridge of the "Oslofjord"



Two electric motors are geared to the rudder. If one fails, other switches in

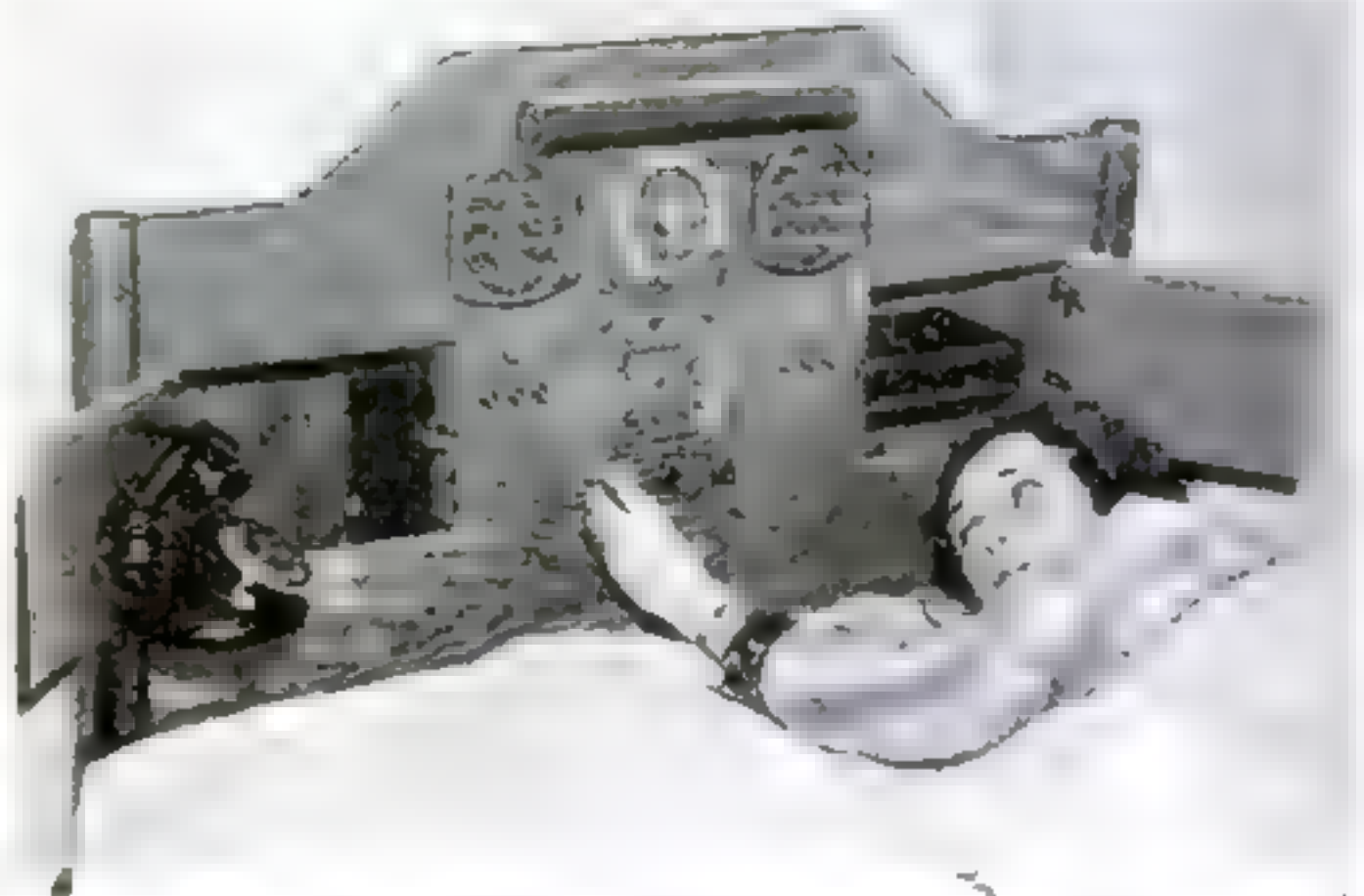
**B**REAKING with sea tradition, designers of Norway's new 18,000-ton ocean liner *Oslofjord* have adopted the innovation of push-button steering. Instead of a steering wheel, a metal box with a pair of thumb-operated buttons—one for port and one for starboard—confronts the helmsman. To change the big Diesel-powered ship's course, he presses either button and holds it down until an indicator shows that the motor-operated rudder has reached the proper position. A two-speed control turns the rudder slowly when the button is depressed only halfway.



## Tool Protects Fingers

DESIGNED primarily to protect a worker's fingers from injury, in operations like feeding sheet-metal blanks into a stamping machine, an ingenious new vacuum lifter also eases his task. To pick up an object, it is simply struck a sharp blow with the tool; to let go of it, a thumb lever breaks the air seal.

FROM a unique bed that he has built, a Chattanooga, Tenn., electrical contractor can make telephone calls, converse with callers at his door over a loud-speaker system, and watch automatic thermostats close his windows or turn on a fan to suit the weather. A radio plays on until he goes to sleep. But he must get up to turn off his alarm clock, which rings again if he gets back into bed within half an hour.



Sleepless nights spent in this bed at least shouldn't be boring

## Dual Unit Helps Road-Map Users

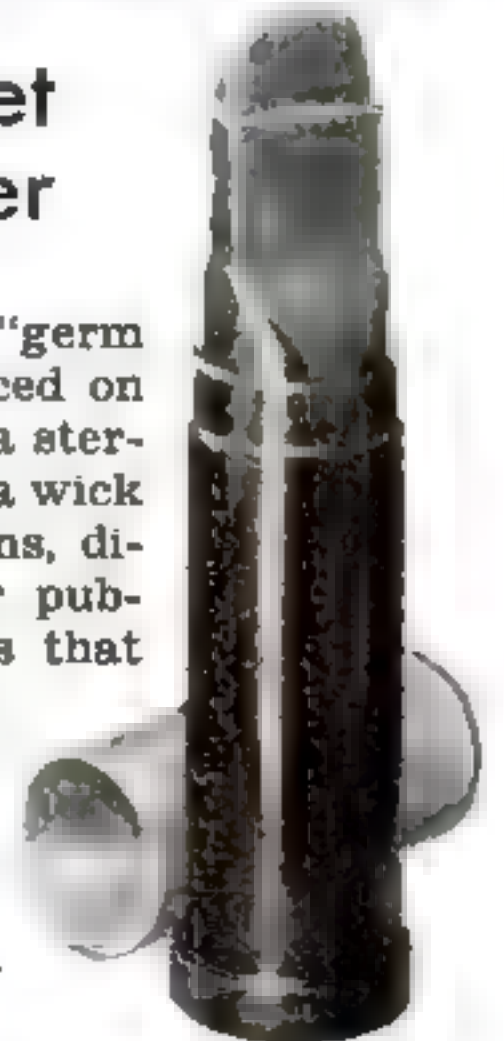
TO AID a tourist in reading road maps, a handy two-in-one accessory has been developed. A two-inch lens magnifies place names and route numbers printed in small type, while a built-in pair of calipers makes it easy to estimate distances by transferring the spacing of a pair of points on the map to the map's scale of miles, as shown in the illustration at the right. The device is small enough to fit the pocket.



Lens and calipers make it easy to follow a road on a map

## Vest-Pocket Germ Killer

A VEST-POCKET "germ killer," recently placed on the market, applies a sterilizing fluid through a wick to paper money, coins, directories, and other publicly handled objects that a person encounters in everyday life. According to the maker, the liquid immediately destroys all germs and odors in the vicinity.





## Come-Apart Frame Fits Mailing Tube

AVAILABLE in gold, silver, or wood finishes, a cardboard picture frame comes apart for shipping in a mailing tube. Designed for use with calendars, maps, and advertising displays in a large number of sizes, the frame is made in sections, the top and bottom being permanently attached to the picture, while the sides are removable for lengthwise insertion in the mailing tube.



Detachable sides allow the frame and picture to be rolled for handy mailing



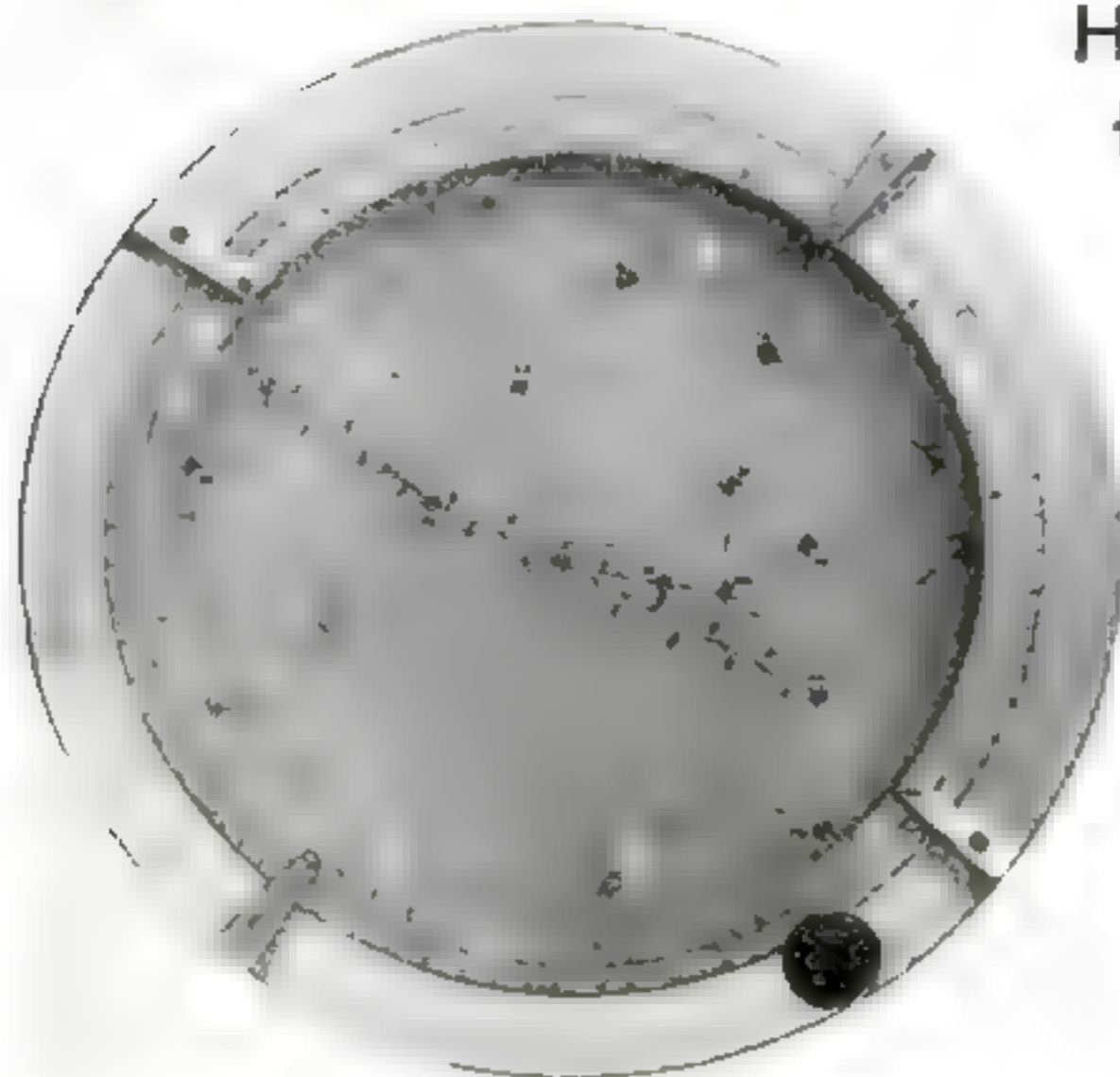
## Huge Dredge Taps New Deep-Sea Gold Fields

DESIGNED to mine gold known to exist on the ocean floor, a giant deep-sea dredge perfected by John C. Williams, San Francisco, Calif., engineer, recently brought up submarine soil from a depth of 1,000 feet—ten times deeper than any previous deep-sea excavation. Of ingenious design, the dredge

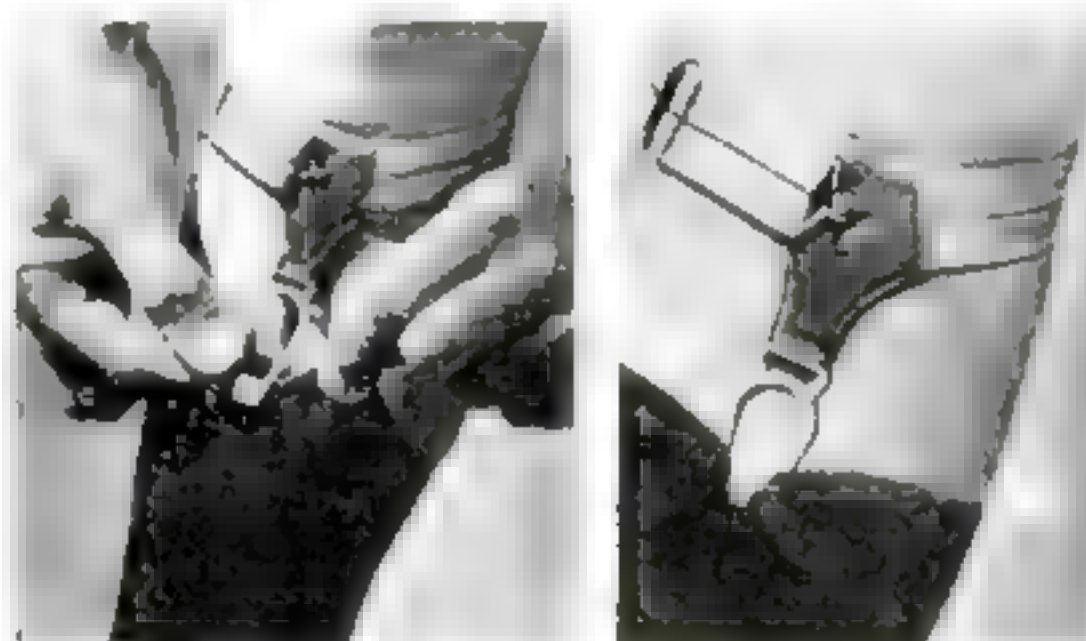
harnesses the tremendous pressure of the water far below the surface, forcing it by means of valves and pistons to close the mammoth jaws when they touch bottom. Lowered on cables from the surface, the ten-ton dredge claws out five tons of ocean bottom with each bite.

## Chart Gives Pilot Location of Plane

AIRPLANE pilots can quickly locate their position with the device below. Three transparent disks revolve in a frame. The top one bears a map of the course. Each of the others has parallel lines spaced to agree with the scale of the map. After orienting the map by compass, the pilot takes radio bearings on two ground stations, aiming a lined disk at each of them. The spot where any two lines intersect each other and the marked course on the map indicates the plane's location.



Adjustable dials show a pilot his plane's position



One full turn of the hinged tip of this garter grip fastens the top of a sock securely as illustrated

## Novel Garter Grip Fastens Quickly

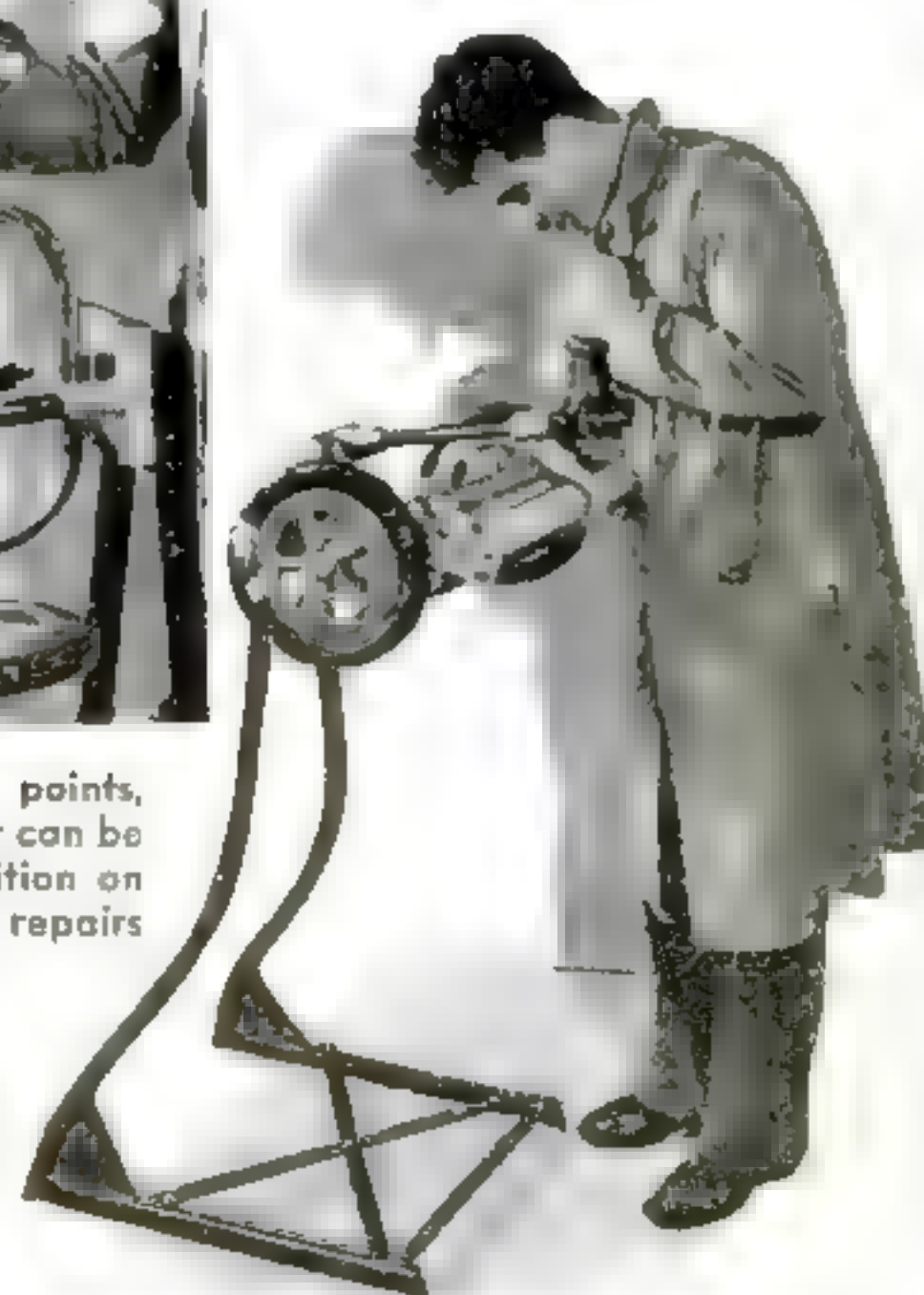
GARTER grips of a type formerly used on women's garments only, are now available on men's garters. The grip has a hinged lower section which is placed back of the upper edge of the sock and then turned with the sock fabric for one complete revolution, grasping the sock securely. The grip can be fastened or released quickly.

## Adjustable Clamp Holds Lawn Mower for Repair Work

LAWN mowers are conveniently held for cleaning and repair by a handy clamp just placed on the market. Supporting the mower at three points, the clamp is easily adjustable to hold the machine in various positions. The device is made so that it may be attached to a plate for fastening it to a workbench, or it may be attached to a special metal standard, three feet seven inches high, as shown at the right. This allows a repairman to work on any side of the mower without moving it.



Held at three points, the lawn mower can be set in any position on the stand for repairs





# Safety Hints



**CANOE MISHAP5.** If you fall overboard from a canoe, get back to it quickly before wind or water currents carry it out of reach. If you have a companion and the canoe turns over, you can both keep afloat until help comes by joining hands across the canoe bottom as illustrated below. The best way is for one to grasp the wrists of the other, taking turns to relieve the fatigue



**STEADYING A CANOE.** The picture below shows how you can help another person to get back into a canoe, if you have a boat handy. Bear down heavily with both hands on one of the gunwales of the canoe while the rescued person climbs into it from the other side



## BAILING OUT A CANOE

The trick at left will get the water out of an overturned canoe: 1. Stand on one end to force it down. 2. Kick canoe forward and out of the water; this will half empty it. 3. Grasp a gunwale and raise it, starting the remaining water sloshing from side to side. 4. Press down, slopping the water over the side. Repeat until dry. Photograph shows how to climb back into canoe

## DON'TS

**DON'T DIVE INTO UNFAMILIAR WATERS—WADE IN OR JUMP FEET FIRST**

(It's more comfortable to find out that water is three instead of thirty feet deep by using your feet rather than your head)



**DON'T SWIM ALONE**

(It's more fun to have a companion—and twice as safe)

**DON'T OVERLOAD BOATS AND CANOES**

(A fifteen-foot canoe will safely hold one, a sixteen-footer two, a seventeen-footer three, and an eighteen-footer four)



**DON'T SWIM WITHIN AN HOUR AND A HALF AFTER MEALS**

(A stomach cramp will double you into a knot, making you as helpless in four as in 400 feet of water)

**DON'T GO IN DEEP WATER ON AN INNER TUBE IF YOU CAN'T SWIM**

(You might lose your hold—and suppose you had a puncture?)



**DON'T SWIM OUT TOO FAR FROM SHORE**

(If you get tired, it's a longer swim back than it was out)

**DON'T LOSE YOUR HEAD IF YOU GET INTO A TOUGH SPOT**

(Panic never saved a life, but it has taken thousands)

**DON'T SWIM OUT TO MAKE A RESCUE IF A BOAT IS HANDY**



(A boat is quicker, and the drowning person will grab it instead of you)



# for Water Sports



**CRAMPS** in the foot or leg need not be dangerous unless you let yourself get panicky. If a cramp occurs in your foot while you are swimming in deep water, fill your lungs with air and go under the water face downward. Grasp the foot with both hands, pressing the thumbs into the instep as seen in the photograph at the right. Steady pressure will release the cramp, but if the foot is cold it may be necessary to knead it vigorously to restore normal circulation.



**UNDRESSING IN WATER.** If you fall out of a boat or canoe while fully dressed and have to swim a long way to shore, the first thing to do is to take off your clothes. Take a deep breath, put your head under the water, and untie your shoelaces as shown at the right. Come up for air, and then duck again to remove the shoes. Repeat the process with your outer garments, and then strike for the shore.

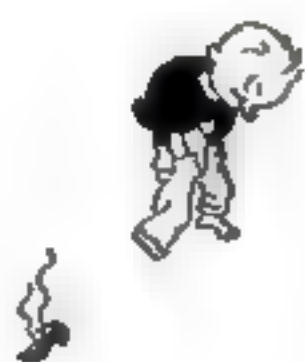


## CRAMP IN LEG

A cramp in the calf of the leg can be removed in a similar manner. Grasp the affected muscle with both hands and press firmly. Look out for cramps at times when you are cold and tired, as these are the conditions under which they usually occur in the water.



**LOOK BEFORE YOU LEAP** into strange waters—and then do it feet first. Never dive when you don't know how deep the water is, or what is on the bottom. If possible, wade out first. If you must jump in, leap feet first with your knees drawn up, as shown in the picture, so that your legs will cushion you if you happen to strike shallow water or some submerged object.



The first step in undressing in water is to take a good, deep breath of air.

In removing shoes, duck down to them; don't try to bring your feet up to you.

Take off your pants a little at a time, coming up for air as often as you need it.

Bunch your sweater up under your armpits; duck and yank it up over your head.

By E. W. Murtfeldt

**D**URING the height of the summer swimming season, more Americans die by drowning than by any other single type of accident—even automobile disasters. More than 7,000 persons drown in the United States alone each year. And most of them lose their lives within thirty feet of shore.

These are the official estimates made by life-saving experts on the

basis of recorded statistics and past experiences. Forty out of every 100 who drown, the records show, know how to swim. Ninety out of each 100 are men and ten women. And seventy-five of each 100 need never have lost their lives in the water, states Capt. Charles B. Scully, director of life-saving for the New York chapter of the American Red Cross.

Thousands could save their own





lives by following a few simple rules before going on or into the water, and by learning and practicing a few simple tricks for getting out of difficulty once they are in trouble beyond their depth.

Knowing, for example, the quickest and easiest method of getting rid of clothes while in the water may save your life if you should ever fall overboard from a boat while fully dressed. It may mean the difference between a losing struggle to overcome the weighty drag of wet, soggy garments and heavy shoes, and a comparatively safe and easy swim to the shore.

A few minutes of practice on dry land or in shallow water in the correct way to relieve a cramp in the calf of your leg or in the instep of your foot, may save you from the fatal panic that often grips even expert swimmers who are attacked by these painful muscular spasms.

Learning how to get back into an empty canoe is not only a lot of fun when you are dressed for swimming and playing around in the water near shore, but it is also an excellent form of "life insurance" that may come in handy at some future time if you ever find yourself clinging to an empty canoe far out in the middle of a broad lake or river.

Some of the most important of these rules and tricks for personal safety in the water are illustrated on these pages by official American Red Cross photographs, and by special staff pictures and drawings. Keep these in

## White-Duck Pants Can Help You Keep Afloat



To use duck pants as a life preserver in an emergency, first wet them thoroughly



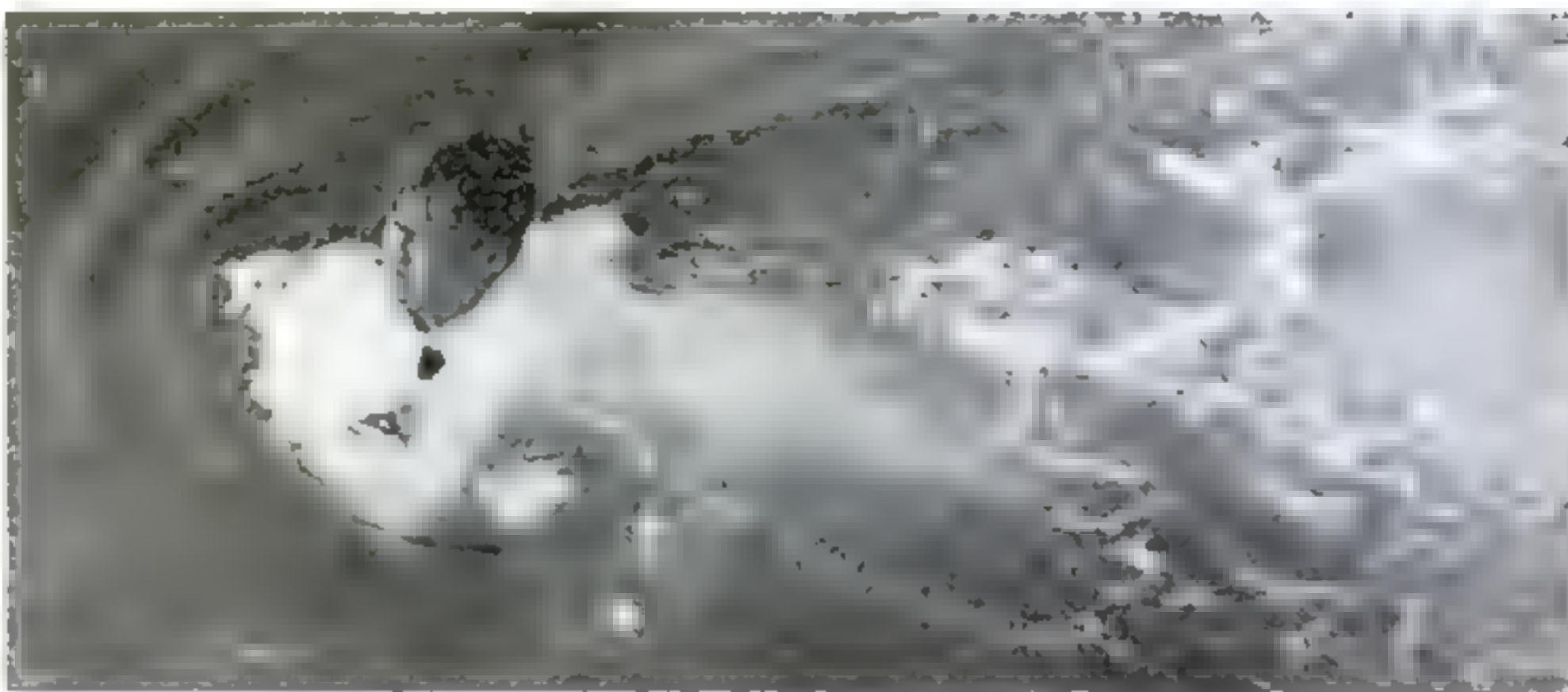
After tying knots in each pant leg, button them, shake them to trap some air, and



... roll them down from the waistband to form a makeshift pair of water wings



If of tightly woven cloth, the improvised "wings" will help to keep a person afloat



mind the next time you head for the beach or the lake. One of them might save your life. Remember, common

sense when you go near the water will do more to preserve you from drowning than all the life guards in the world.

## Streamline Trailer Houses Racing Boat and Crew



At the forward end of this boathouse on wheels are comfortable living quarters for two

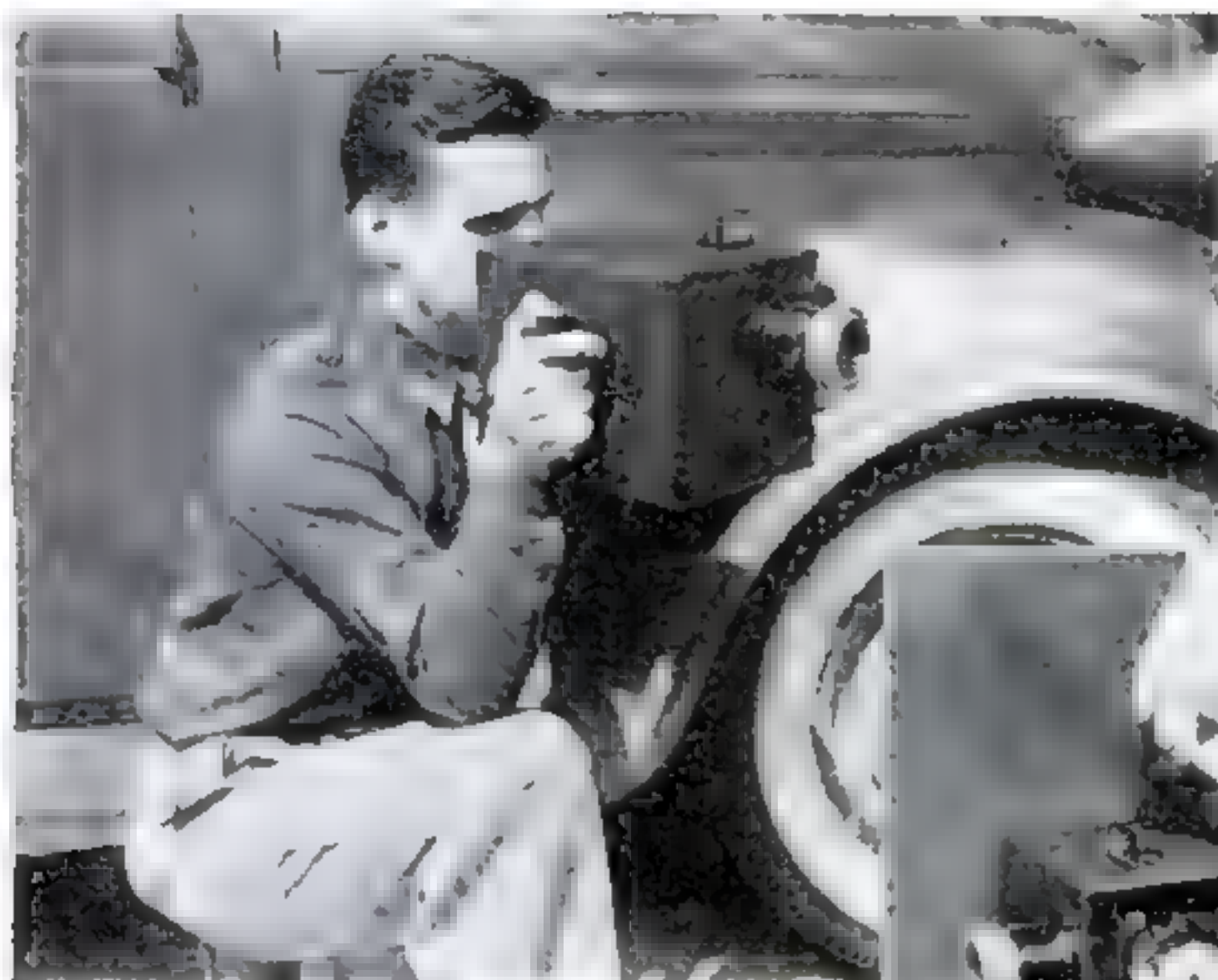
DESIGNED to transport an outboard-motor racing boat and its pilot from the site of one race to another, a novel streamline automobile trailer serves as both a land garage for the boat and a home on wheels for the crew. The boat, motors, and other racing equipment are housed in the rear of the trailer, easily reached through rear doors and the back of the sloping roof, which swings upward. Living quarters at the front accommodate two persons and include a galley, wardrobes, lavatory, and other conveniences. The trailer body rides on a twenty-two-foot, four-wheel chassis and has electrically operated brakes.



How an outboard racer, two motors, and equipment fit snugly inside the trailer can be seen in the oval above. Below, pitching camp near the starting point of an outboard race



# New Ideas for the Camera Fan



The rapid-fire camera in action. No tripod is needed, and it works in dull light

Below, a fifty-foot roll of seventy-millimeter film is being put in the chamber

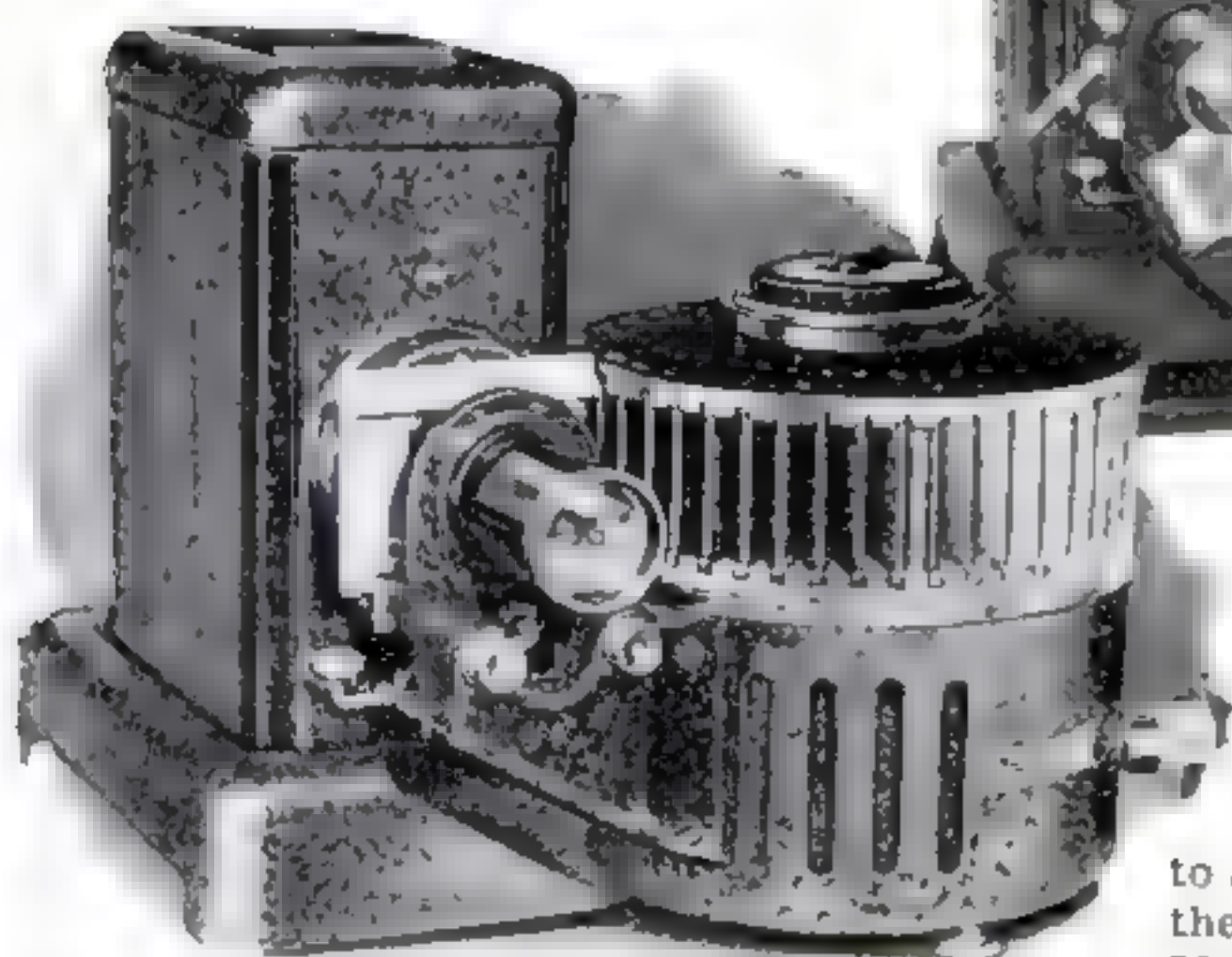


## Rapid-Fire Camera Gets Eight Shots a Second

USING motion-picture film seventy millimeters wide, twice the width of standard Hollywood film, a new rapid-fire still camera will snap as many as eight pictures a second. It enables a news photographer to record a storytelling sequence of pictures on negatives  $2\frac{1}{4}$  by 3 inches. This size is suf-

ficiently big to permit huge enlargements or the "blowing up" of a small portion of the negative into a large picture. The film chamber accommodates a fifty-foot roll of film, while the  $F/2$  lens is sufficiently fast to record action even in dim light.

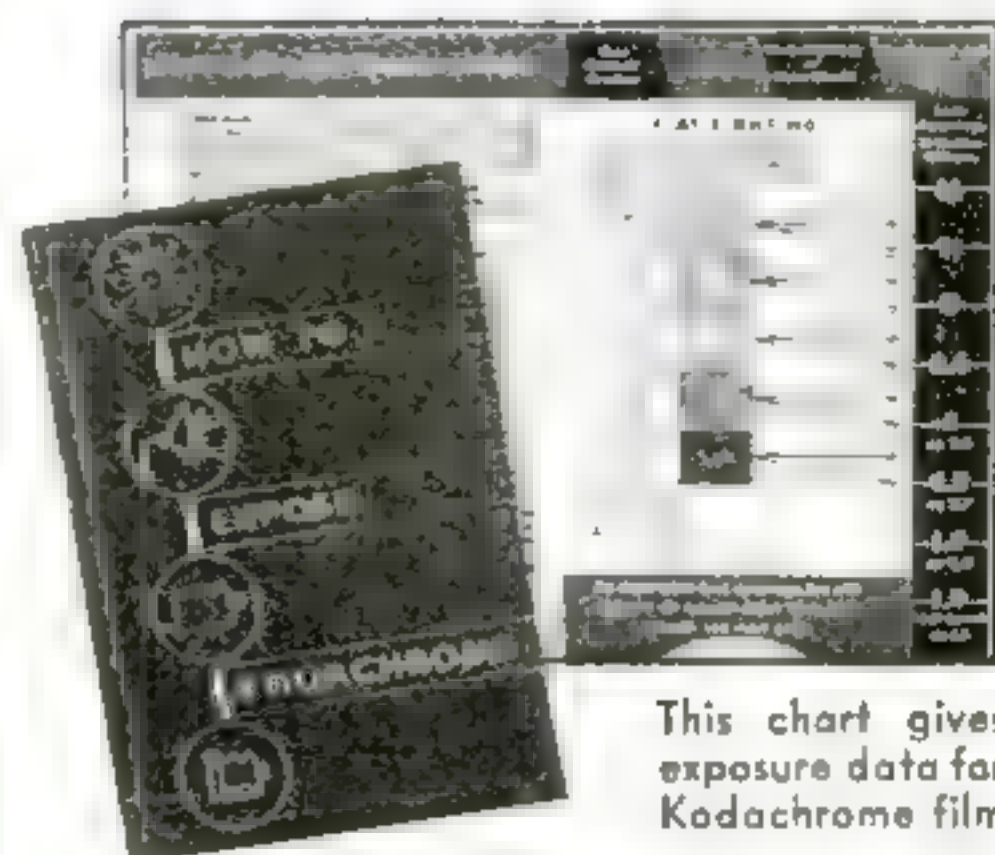
## Automatic Projectors for Lantern Slides



Automatic projector for advertising use and, left, the forty-eight-slide machine designed for lectures

**T**WO new projectors, using miniature lantern slides, automatically flash a series of pictures on a screen at predetermined intervals. One, holding twelve slides which are shown over and over again, is designed especially for advertising use. The other is intended for use by lecturers. Its rotating drum accommodates forty-eight slides which slip into place one after another behind the lens of the projector as the magazine rotates intermittently. The length of time the picture remains on the screen, ranging from ten seconds

to a minute, depends upon the setting of a rheostat. If desired, the forty-eight-slide projector can be operated by remote control so the lecturer can shift the slides at will by pressing a button at the end of an electric cable. Both of the new machines take two by two-inch slides which accommodate miniature-camera negatives either in black and white or in natural color. When the slides are inserted in their proper order in the magazines, there is no danger of mistakes in sequence, as in manual operation.



This chart gives exposure data for Kodachrome film

## Color Exposure Guide

THE problem of obtaining correct exposures for Kodachrome natural-color film is simplified by a vest-pocket calculator now available. When a small dial is set according to a chart, it automatically indicates the correct lens opening and shutter speed for any scene.

## Eight-Millimeter Titler

RESEMBLING a desk lamp, a new titler for eight-millimeter home movies permits the amateur to make animated maps and cartoons as well as titles for his films. A copying lens focuses the camera on cards containing drawings or printed matter. Twin lamps illuminate the cards.



## Table-Top Midget Darkroom

A MIDGET darkroom now enables the amateur to develop films and print pictures in normally lighted rooms. Inserting his arms in light-tight sleeves, he can watch his operations through a pane of safety glass.



Developing is watched through a pane of safety glass



# Aviation's

**T**HERE they go! Art Chester flashes past in his *Goon*, a two-pitch propeller slicing the air backward. Lee Williams in his flying torpedo. Steve Wittman behind a pair of square-end barn doors. Russ Chambers, cramped in the cockpit of his tiny special, which stands no higher than your knees.

Sometimes Wittman or Williams touches 400 miles an hour diving into the straightaway. None may fly in these races for winged gas cans unless he hits 225 during qualifying rounds. More speed is coming, from out-of-the-way garages, back-lot hangars, youthful engineers who turn from everyday jobs to pit their skill against veterans of the race lanes.

Chambers is the newest seeker of fame in the air. A few months ago he was a little-known pilot in California. By day he worked as a mechanic. At night he labored over a tiny ship whose wings stretch less than fourteen feet from tip to tip. Into the nose he bolted an eighty-five-horsepower air-cooled engine. Then he took off in a series of test flights.

Three successive afternoons, Chambers opened the throttle, wavered into the air. He dared not race the engine and pick up real speed, for he found the tiny craft was dropping out from under him as he flew, sometimes 100 feet at a crack. He consulted an engineering friend, who told him he

needed more tail surface. Chambers knocked down the plane, reconstructed its controls, and a few days later loaded his little speed job on a truck and headed for Oakland, Calif., where he planned to enter the races.

Five eager pilots faced the starter's flags that afternoon, awaiting the signal which would send them aloft in a fifty-mile dash around the closed course. Chambers, having arrived too late to qualify, was permitted a "courtesy" start, and occupied last place in the line-up. Down went the checkered flags, ahead roared the ships in a race-

Tiny homemade racers like this try out new ideas in plane design



horse start, and around the first pylon they scurried like frightened rabbits, some bucking and jumping in the pilots' eagerness to gain altitude.

In a few brief rounds, young Chambers received his first taste of flying against the speed aces. Thirteen minutes after Starter Joe Nikrent signaled the pilots away, Earl Ortman pulled up in front of the stand to receive the winner's ovation. At that moment Chambers was sitting on his plane in a near-by bean field, forced down when his gas supply gave out; Steve Wittman was pulling his battered body

**Flying Gas Cans, Piloted by Dare-Devil Airmen in Thrilling Races, Try Out New Developments To Bring More Speed and Safety to the Skyways**

**By ANDREW R. BOONE**



Russ Chambers, one of the daring young pilots, squeezing into the cockpit for his first race

At the right, an assistant snaps the removable cockpit cover in place above the flyer's helmet



Thirteen minutes after taking off, Chambers was forced down in this plowed field



# Guinea Pigs

from the wreckage of his abbreviated Oshkosh special; and Gus Gotch, veteran of many races, lay dead in the mud of San Francisco Bay, where he had fallen when his Folkerts monoplane plunged earthward in a screaming tail spin.

One of the race committee rushed to Chambers, little thinking he could touch his wheels to the soft earth of a ploughed field and live.

"Boy," he panted, "you're lucky to be alive. And say," he added, "do you know you finished before you came down? Fourth. Five hundred and fifty bucks."

"Gee," exclaimed the young flyer. "That's great. Now I can buy a supercharger. That ought to give me another thirty miles an hour."

Chambers already had made an important contribution to the art of space-saving and streamlining. When he took off, he turned a crank attached to a bicycle chain which wound his wheels directly into the fuselage. Only two tiny holes were necessary for the landing gear, and these offered little opportunity for air turbulence whether the wheels were up or down. When faced with a forced landing, he merely uncranked, and the two shafts pushed the wheels down, where they automatically locked in place.

These races for baby planes, which find their highest expression at the National Air Races in September, bring new devices and new scientific application each year which are steadily pushing speeds upward. The pilots are roving scientists who seek an explanation for each crash, hoping thereby to make their own planes safer against like accidents.

**H**ARDLY had Gotch met his doom before his companions of the air gathered in a near-by hangar trying to determine the probable cause, which examination of the battered wreckage could not reveal. Tail surfaces too small? Tricky ship? How about the retractable landing gear?

"In that plane," said one of the pilots, "Gus pulled the gear up, then gave it a final snap into place. Maybe as he snapped, he moved the stick a trifle. He was flying barely 200 feet up, and at 250 he'd be in the water before he could bat both eyes."

Perhaps this does not explain Gotch's tragedy, but no pilot ever again will use a gear-retracting system which requires a hefty tug to pull it finally into the sockets.

These boys are always trying something new. The blue sky is their wind tunnel. They build a plane, then risk their own necks testing it, instead of submitting it part by part to a laboratory.



Steve Wittman pouring gasoline into his fuel tank. He doesn't trust anybody else with this job. At the right is a tall, checkered pylon marking the finish line

For several years, Wittman has been racing his blunt-nosed creations, and each year he adds a few more miles to their speed. He alone of the experienced pilots uses a rectangular, non-tapered wing section, which looks thin as paper in the air. External bracing makes the wings rigid. He gets speed from the powerful 1,000-horsepower engine rather than from streamlining.

Wittman, unable to afford costly wind-tunnel tests, during the last few months has been dropping objects of various shapes at high altitudes and observing them as they fell to earth. As he flew his smaller racer around Oshkosh, Wis., he studied carefully an accelerometer fixed to his dashboard. From the falling forms, and forces recorded by the accelerometer, he put together a new and larger plane, which gives him slower landing and higher top speed than any former model.

Two problems continued to bother him: how to make sure of safe take-offs and landings, particularly if forced down on a rough field; and how to force enough air past the engine to keep it cool at top speed.

Wittman didn't want to be bothered with retractable landing gear, so he experimented with single-leaf springs until he found one which, when properly tempered, will bend double without breaking. Now each wheel is fixed to a leaf of steel, strong enough to support the ship fully loaded, yet capable

of extreme bending. "You can tie 'em in knots, or bend the wheel clear in to the wing," he assured me. "And they're so thin, they offer virtually no head resistance."

To cool the engine at high speeds, Wittman placed a circular radiator around the (Continued on page 92)



Wittman's engine-cooling system—a circular radiator and a sixteen-bladed fan on the propeller shaft



# Bike Wheel Chair Modernized

LIGHTWEIGHT all-steel construction, spring suspension, and comfortable seats for passengers, give new riding qualities and ease of operation to an improved tricycle wheel chair recently introduced at beach and summer resorts. As in older vehicles of the kind, the operator steers and propels the chair from a bicycle saddle at the rear.

Attendant rides behind to pedal and steer the vehicle

## Car Accessory Holds Comb



Pins hold the case in place on the upholstery

HANDY and inexpensive, a novel automobile accessory holds a comb and provides a convenient celluloid strip for noting oil and greasing mileages. Two sharp pins on the back of the holder make it easy to mount within easy reach at any place on the upholstery of the car.

## Ex-Traveler Prefers Berth to Bed

BECAUSE his business had kept him traveling back and forth across the country in Pullman cars for twenty-five years, George L. Weiss, of Long Beach, Calif., retired railroad-equipment salesman, declared he wasn't comfortable in a conventional bed. So he built the Pullmanlike compartment he is shown entering below in his house, to give him that "at-home" feeling again.



George L. Weiss in the place he calls "home"

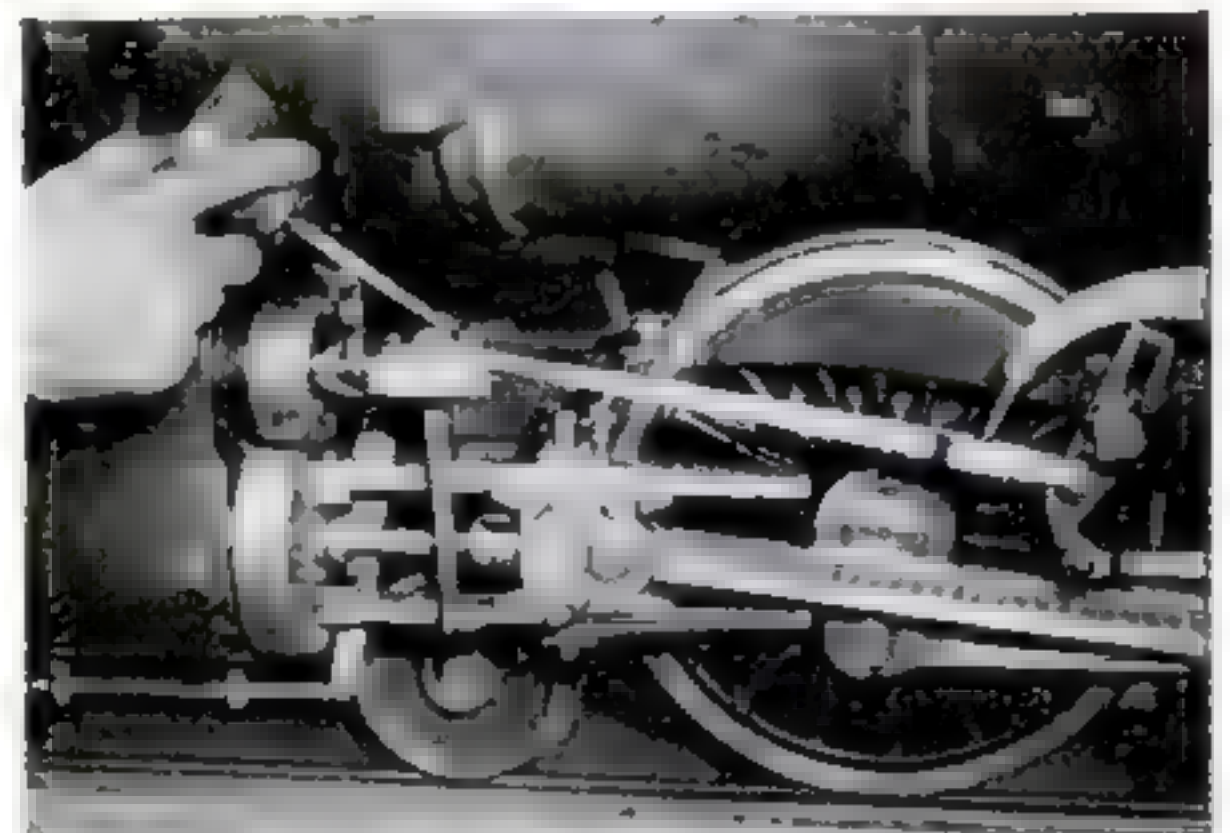
## Safety Unit for Autos

DESIGNED to increase automobile safety, a new accessory automatically shifts a car into neutral if the car strikes an object while moving in high gear. The device thus prevents the car from running wild if the driver is injured.



## Eleven-Foot Model of Locomotive Is Powered by Steam

WEIGHING nearly a ton and capable of pulling twenty passengers at thirty miles an hour, a steam-driven model of a Pacific-type locomotive is nearing completion in the machine shop of Frank W. Brown, of Ravenna, Ohio. Built to a scale of an inch and a half to the foot, the model with its tender is eleven feet long. Its builder shaped and fitted each part with careful attention to detail to insure smooth running of the model. In the upper illustration also can be seen the chassis, cab, and smoke box of an earlier model built by Brown ten years ago. It is a 200-pound reproduction of a 1910-type Mogul that has pulled a load

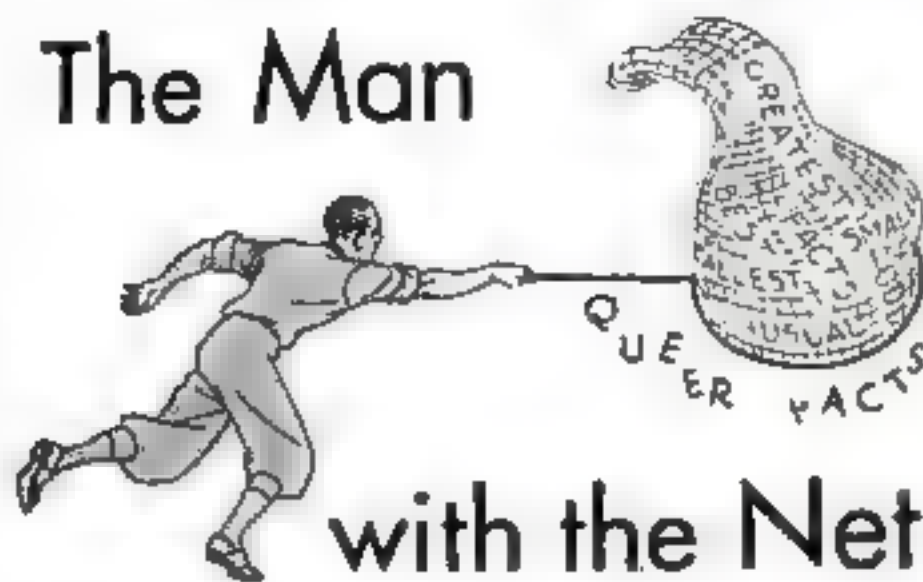


Putting some finishing touches on the huge model locomotive built in three years by Frank W. Brown in his own machine shop. Lower view shows the intricate valve gear

of seven adults. Brown plans to build a narrow-gauge track in his yard on which to run his latest coal-burning model when it is finished. The working parts of the model have already undergone successful tests in his workshop.



## The Man



## with the Net

AMAZON RIVER tribes use chicle, the basis of chewing gum, to make casts for setting broken bones.

SNAKES in the London, England, Zoo are being provided with gasproof cages.



YELLOWSTONE Park contains more geysers than are found in all the rest of the world.

DEER antlers are powdered and administered as a tonic for run-down patients in some parts of the Orient.

CHEMICAL foods, injected by hypodermic needles directly into the blood stream, now save the lives of patients suffering from severe stomach disorders.



WE 8 10  
COMMUTERS  
COULD USE  
THAT

METEORITES sometimes strike the earth so cold they are covered with frost.

ALASKA'S Mount McKinley rises higher above its surrounding country than any other mountain in the world.

ELEPHANT ears function like automobile radiators, helping keep the animals cool by circulating blood between comparatively thin layers of tissue.



FISHHOOKS made of mother-of-pearl were used by natives of the South Sea Islands.

ELECTRICITY from automobile traffic is visioned by an eastern inventor. Wheels passing over raised plates in the highways would operate pistons to turn generators.

NORTH Dakota is the only state in the Union where termites have never been reported.

HOW ABOUT THE  
POLITICAL  
VARIETY?

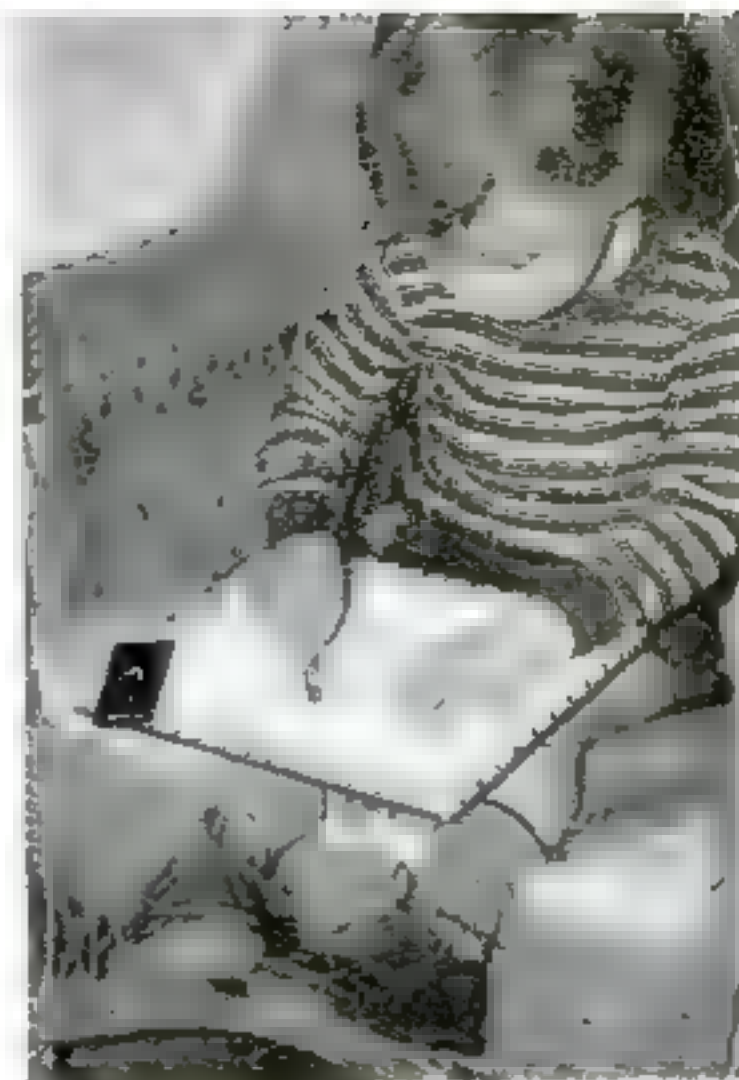


## Calendar Unveils Fair

TEARING off the daily dates on a novel calendar designed for the New York World's Fair uncovers little by little a drawing of the finished exposition. Removal of the last date, in March 1939, will complete the unveiling at the time of the fair opening.



Dates torn from the calendar reveal new scenes at fair grounds



## New "Slate" for Colored Crayons

A NEW writing "slate" for children has a white, glossy surface on which pictures or lettering may be drawn in various colors. Six colored crayons and an erasing pad come with the inexpensive, nine by twelve-inch slate.

## Motorists Try Car Radios While Getting Gas



Customers try out a radio, hung, as in inset, on their car door

AUTOMOBILE radios are now being demonstrated at filling stations and garages when customers drive up for gas and oil. The demonstration radios are fitted with rubber-covered wire brackets so that a set can be hung on the door of a car. Wires lead to a current supply and antenna so that the motorist can tune in a program and hear the set in operation while he waits for his car to be serviced.

## Set Tuner Picks Week's Programs

LISTENERS can set their radios a week in advance to tune in automatically any desired sequence of programs over eight different stations with an ingenious automatic tuner developed by Harold J. Kaye, of New York City. The mechanism automatically adjusts the receiver to bring in programs that have been selected previously by inserting small keys into holes in a moving cylinder. An electric clock mounted in a decorative housing on top of the radio cabinet provides the necessary power to turn the selector cylinder. As many as 672 separate programs can be tuned consecutively within the space of one week by the device.



This automatic tuner dials 672 consecutive programs



Modern eye-testing machines, like the binocular ophthalmoscope at the right, make it possible to design glasses for every need. Below, special right-angle spectacles that enable an invalid to read while lying flat on the back in bed



**S**IXTEEN men, every day, were suffering eye injuries in the plants of one California manufacturing concern. Compensation-insurance rates were soaring sky-high, for many of the accidents produced blindness. Yet, any suggestion that the men in the machine shops wear safety goggles was met with howls of protest. Goggles were heavy, clumsy things. The men wouldn't be bothered with them!

In desperation, officials called in Dr. Arthur Hoare, Los Angeles optometrist. Word went out that the company would furnish goggles, and that all machinists must wear them on pain of dismissal. When the streamline goggles arrived, the men found them different from what they had expected. Made of lightweight alloys, the frames were little heavier than those of ordinary spectacles and the armor-plate glass, annealed like case-hardened steel, was so tough you couldn't break it with a hammer. Soon the men were proudly wearing their goggles home from work, for each pair was tailored to the individual needs of the user. Modern eye magic had won another victory in safeguarding and improving vision.

If you do desk work, nearly seventy percent of your day's energy is used up by your eyes. Strained, tired eyes mean inefficiency. With this knowledge, eye

# Modern Eye Magic

## GIVES STREAMLINE VISION

experts now are applying some of the latest scientific developments to make your day's eye work easier. Complex lenses with many ranges of vision; metal-paned spectacles without any glass in them; machines to train weak eyes or build up undeveloped eye muscles—these are among the new devices for reducing the daily labor of the eyes.

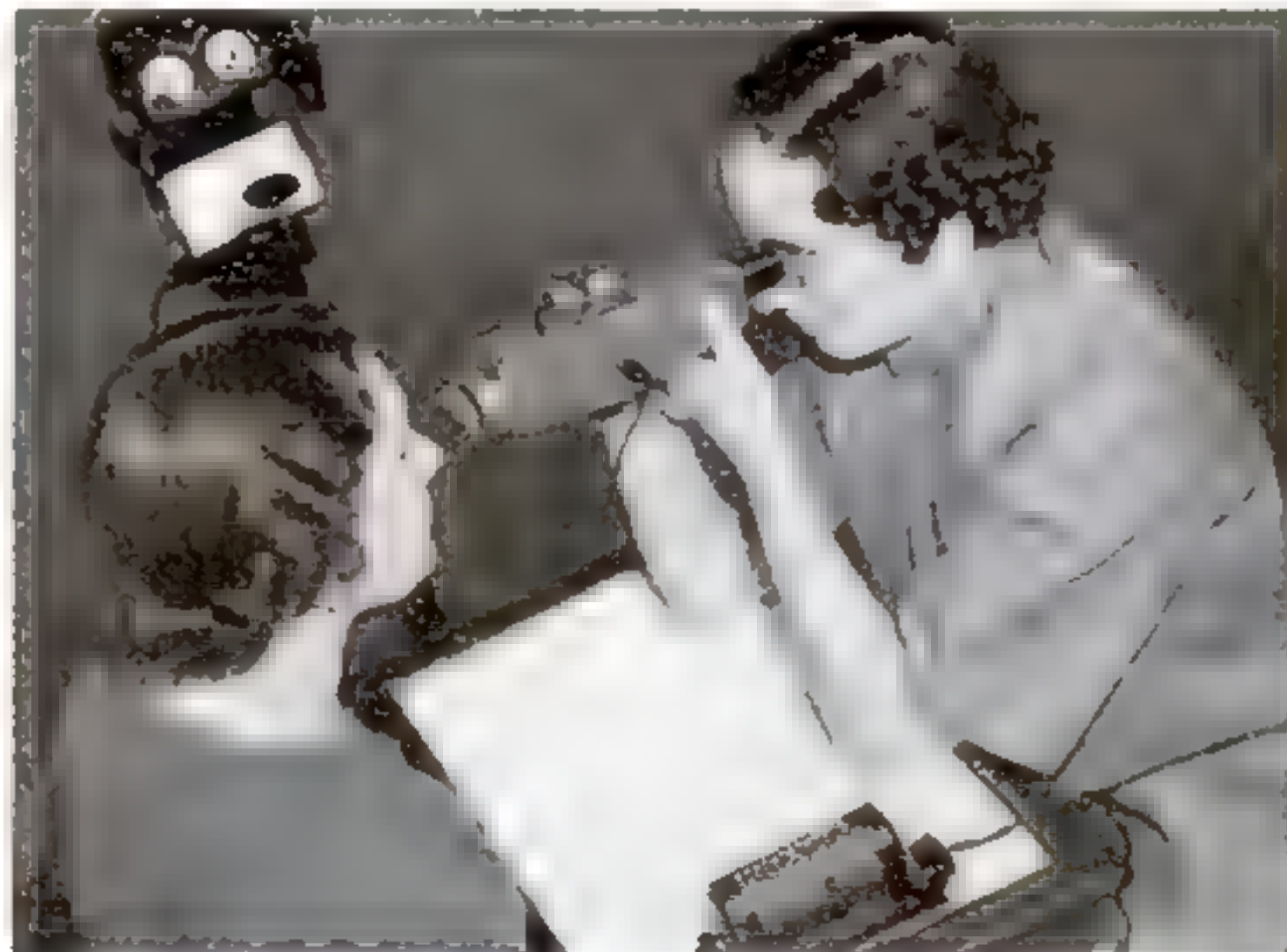
If you work in a modern industrial plant, the chances are that the problem of eye strain already has been studied closely. Your desk top may have been rubbed down to remove a dazzling gloss, or turned to face away from a window. Perhaps foot-candle meters were used to point out spots where dim lighting was making tired eyes, and

banks of specially selected lamps installed where illumination was below comfort level. Or maybe the company doctor has fitted you with special glasses for your particular job. If so, you've seen a few results of this new knowledge in eye-saving.

More than a century ago, Benjamin Franklin found that carrying around two pairs of spectacles was a nuisance, so he cut the lenses and rearranged the pieces with the upper half for far vision and the lower half for reading.

**Experts Devise Complex Lenses and New Lighting Methods To Guard Your Sight, Increase Efficiency, and Reduce Fatigue**

**By STERLING GLEASON**



This is a simpler version of the instrument shown at top of page



Today, optometrists have improved on his crude bifocals to the point where they are grinding three, four, and even five different curvatures onto a single lens.

Not long ago, a lathe operator walked into the clinic of the Los Angeles School of Optometry. "What's the matter with my eyes, Doc?" he demanded. "They're getting so I can't tell what's going on under the cutting tool without sticking my head so close I'm likely to get my jumper caught in the machinery."

Dr. Ernest A. Hutchinson, in charge, put him through comprehensive tests. "No wonder you're having trouble!" he exclaimed. "Your near-vision lens works fine up to thirteen inches, and the far-vision part is good beyond twenty—but between, there's a seven-inch gap—a no man's land where nothing is in focus. You can't 'trombone' a lathe to bring it in range, and your eyes won't adjust themselves, so we'll have to fit you with glasses that do it for them."

He prescribed a lens with three crescent-shaped grindings: a large upper section for looking across the room; an intermediate range for the normal working distance; and a close focus for reading the micrometer scale. The trifocals answered all the machinist's working problems and gave him eyes equal to those of a man twenty years younger.

Bifocals used to be considered "old folks' glasses," but today optometrists are putting them on young children to "rest" the eyes from muscle strain and correct near-sightedness. Often, too, exercising machines can aid by actually strengthening weak eye muscles and speeding up slow-acting retinas to develop better coordination. Still another device aids in overcoming squinting.

Two young men who wanted to become naval aviators failed to pass the physical examinations. They were advised to go to an optometry



Spectacles fitted with auxiliary lenses that give high magnifying power for close work



Tailored light from special lamps like those shown above ease eye strain in modern factories

clinic. A few minutes each day, spent in looking into a mechanical "refractor," soon developed their vision to the point where they were able to go back and pass the tests with flying colors.

If you have exceedingly weak eyes, don't worry. You can get a pair of glasses resembling small pocket microscopes or opera glasses, which magnify up to twelve times, so that if you have only one-tenth normal vision you will be able to use your eyes.

Have you ever wished you could see around a corner? You can, with a pair of freak "specs" made with small prisms to bend the rays at right angles. With them you can look

straight ahead and see what is in your lap. They are specially made for reading while lying on your back in bed.

Then there are the spectacles without lenses—just the thing for men who work around blast furnaces. Photographers often experiment with "pin-hole" cameras which consist simply of a strip of film in a box, with a tiny pin-hole serving as lens. The same principle is applied in the spectacles. Pinholes punched into a steel disk act as diminutive lenses. The iron "glass" cuts down the intense glare of the open furnace and at the same time protects the eyes against flying droplets of metal or fragments of hot ash.

This lens also may help a person afflicted with (Continued on page 99)

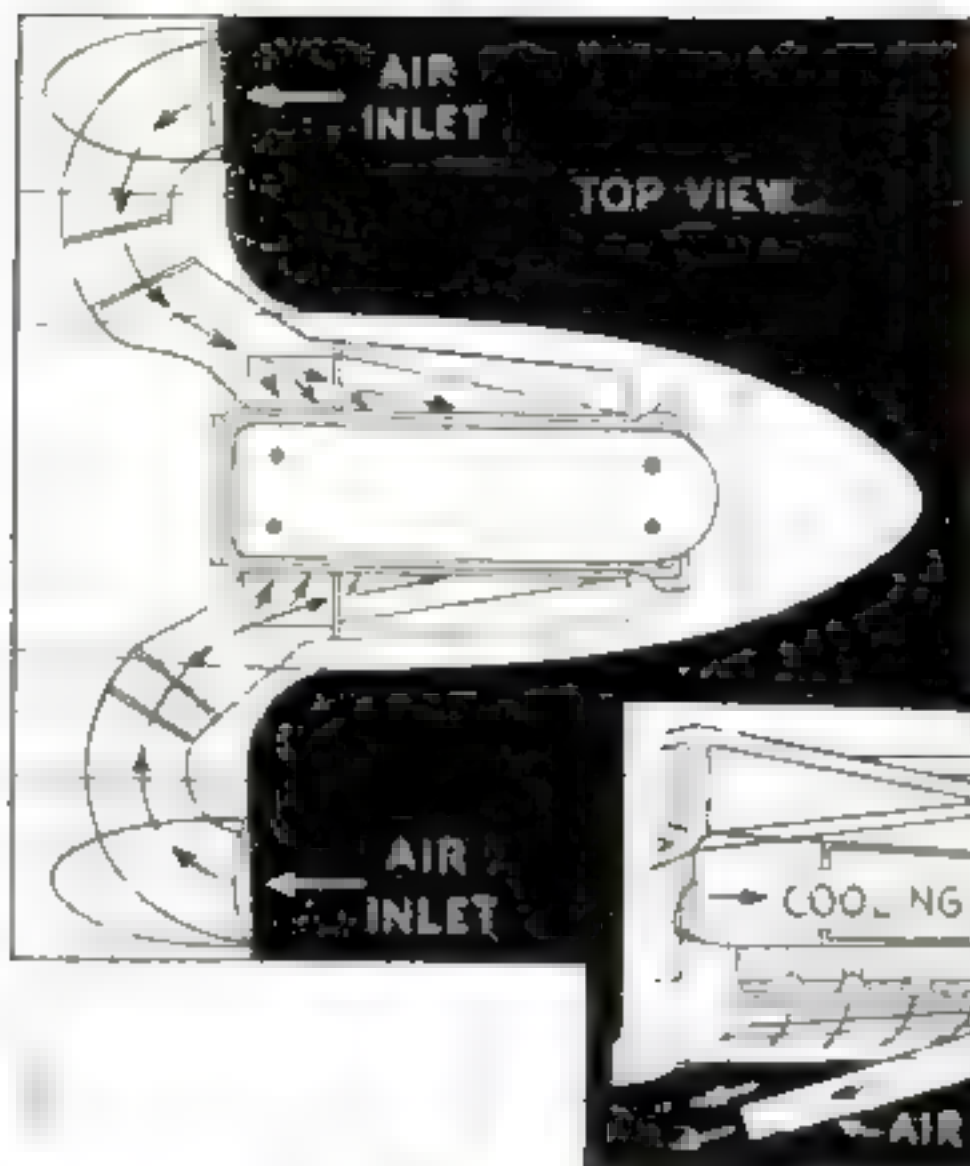


Optometry students learning to recognize eye defects with models like the one pictured at the right

Colored photographs of retinas, viewed through a lens, show students abnormal conditions just as they would appear if seen in an actual eye







How air, caught by ducts in the wing, is led over an engine and allowed to escape from an outlet

## Cooling System for Plane Engines Uses Air Piped from Wings

INTAKE ducts in the leading edges of the wings, and exhaust flaps below the motors, are features of a new air-cooling system for airplane engines invented in England. When the plane is in flight, air rushes into the wing openings, is carried through ducts to circulate around and cool the engines, and is then allowed to escape through the hinged exhaust flaps, which are opened and closed by a hydraulic mechanism controlled by the pilot. The system is said to insure efficient cooling, and to permit better streamlining of the engine cowlings.



A British airliner equipped with the novel engine-cooling system. One of the intake ducts, and the outlet of the nearest nacelle, are shown

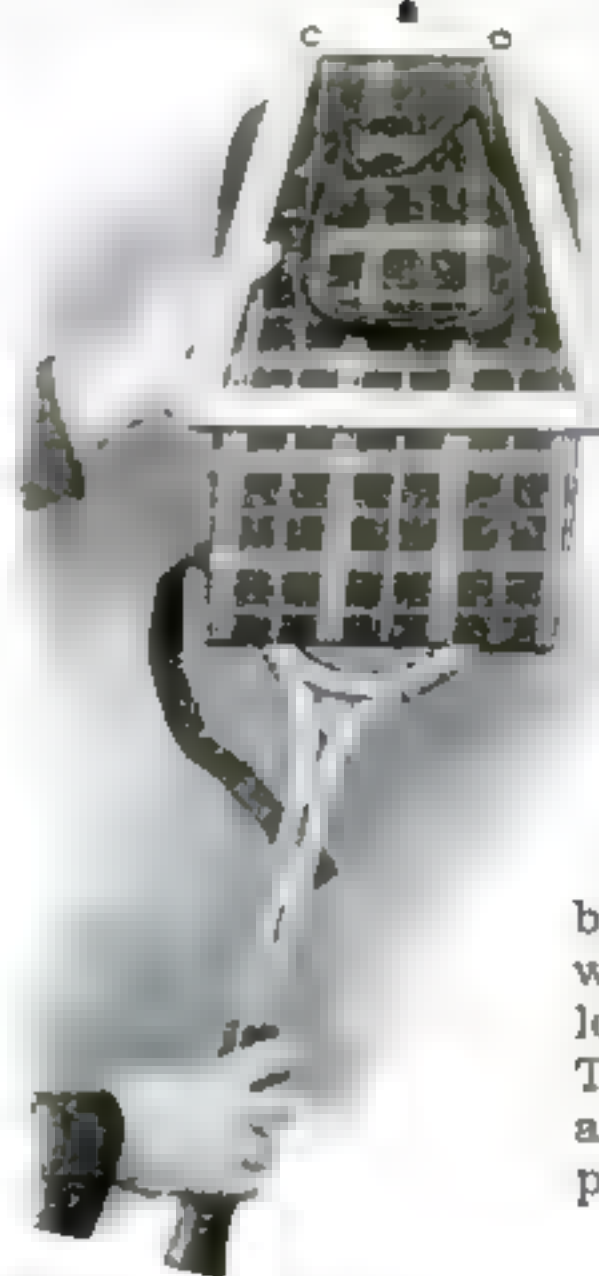
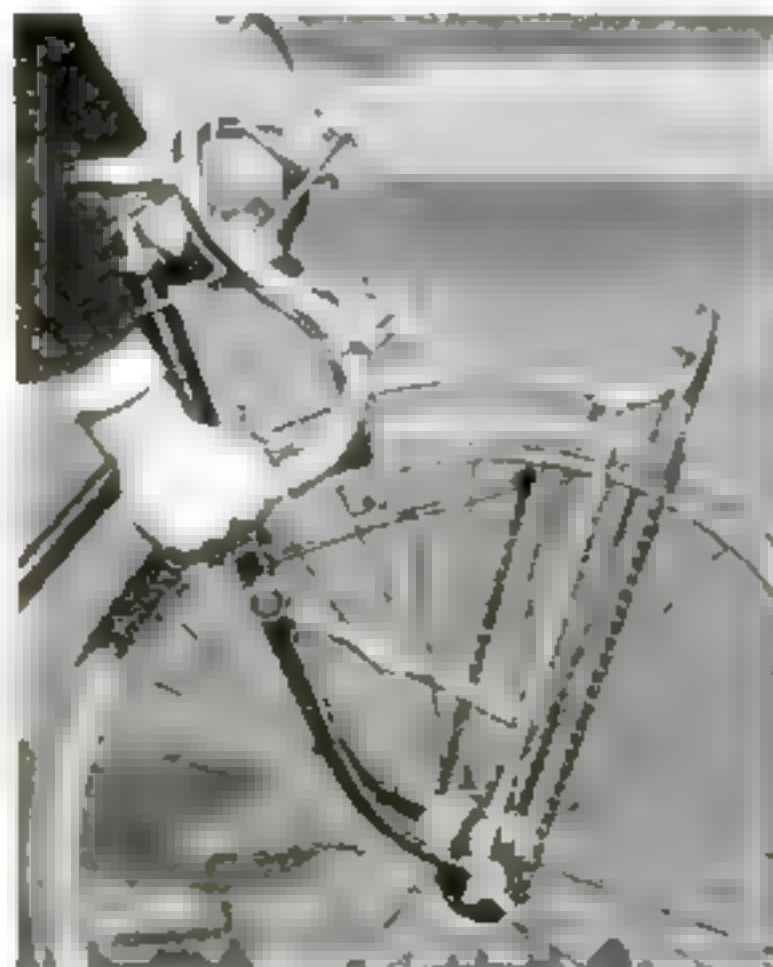
Both pedals and handlebars help drive this bike



Right, front-wheel-drive mechanism operated by pumping with the hands

### Handlebars Drive Bike's Front Wheel

TAKING advantage of the fact that the average bicycle rider bears down with his arms on alternate sides of the handlebars as he pedals along, a French inventor recently devised a bicycle having hinged handlebars that are pumped from side to side to apply power to the front wheel while the pedals drive the rear wheel. By working the handlebars as well as pedaling in the conventional manner, the cyclist is said to add twenty percent to his power and speed.



### Press for Racket Has Built-in Waterproof Cover

WATERPROOF cover and tennis-racket press are combined in one accessory recently placed on the market for the convenience of tennis enthusiasts. Permanently attached within the press, the cover has a pocket that holds four balls, and a loop at the top with which to hang the racket in a locker or closet when not in use. The waterproof cover comes in a wide variety of colors and patterns.

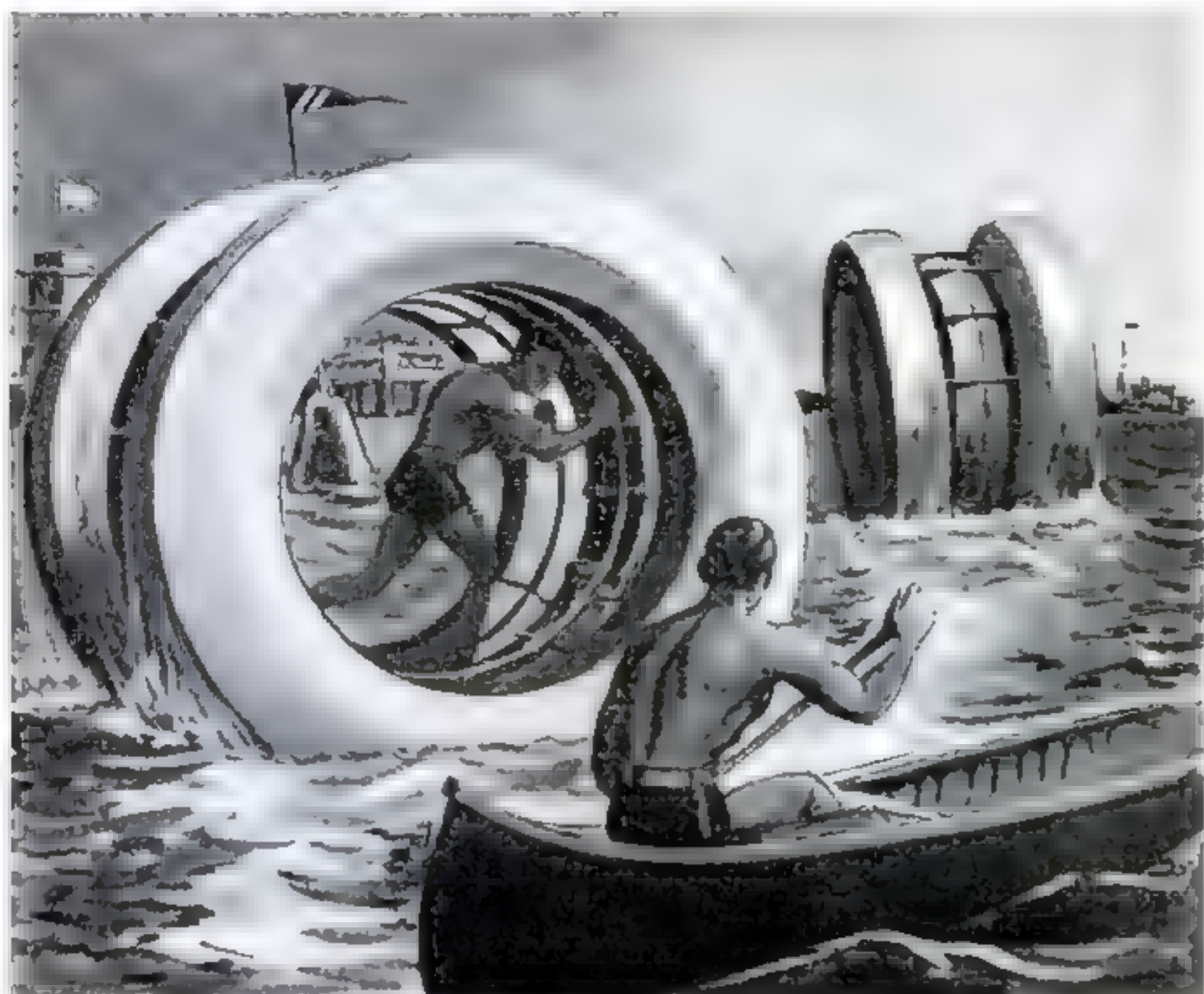
### Combination Unlocks Revolver

BUILT into the handle of a revolver, an ingenious combination lock prevents the gun from being fired by anyone who does not know the combination. The locking mechanism can be operated quickly by pressing in a definite order small finger keys set into the butt. The novel firearm was designed especially for police use.



Pressing small finger keys in the butt permits the gun to be fired





## Water-Wheel Racing Is New Beach Sport

PROPELLED in squirrel-cage fashion, buoyant "water wheels" of wood and light metal provide a novel water sport that is rapidly gaining in popularity at European shore resorts. By shifting his weight from side to side,

a skillful athlete can steer the huge wheel accurately as it rolls along the surface of the water. Various sizes accommodate from one to four bathers apiece, and races are staged between rival teams.



## Safety Goggles Go On at Shake of Head

SAFETY goggles of new design, which fall into place when the wearer merely nods his head, enable mechanics and welders to protect their eyes without laying down their work. A slightly more vigorous shake of the head, or a flip with the thumb, pushes the glasses back out of the way when they are no longer needed. The goggles are specially designed for jobs in which eye protection is not wanted continuously. Since the user can adjust them while both hands are occupied, the dangerous temptation not to stop to put on goggles is removed.

## Electric Eyes Time Punches

HOW FAST does a boxer's punch travel? Upward of forty miles an hour, is the verdict of an electric-eye device, developed by General Electric engineers, which measures the time required to intercept two light beams about a foot apart. Untrained spectators, matching jabs with a trained heavyweight, in recent tests with the unusual measuring machine, attained less than half his registered "fist speed" of 40.2 miles an hour.



Boxer's fist intercepting light beams that gauge speed



This is how a well-behaved bullet should look as it hits the target

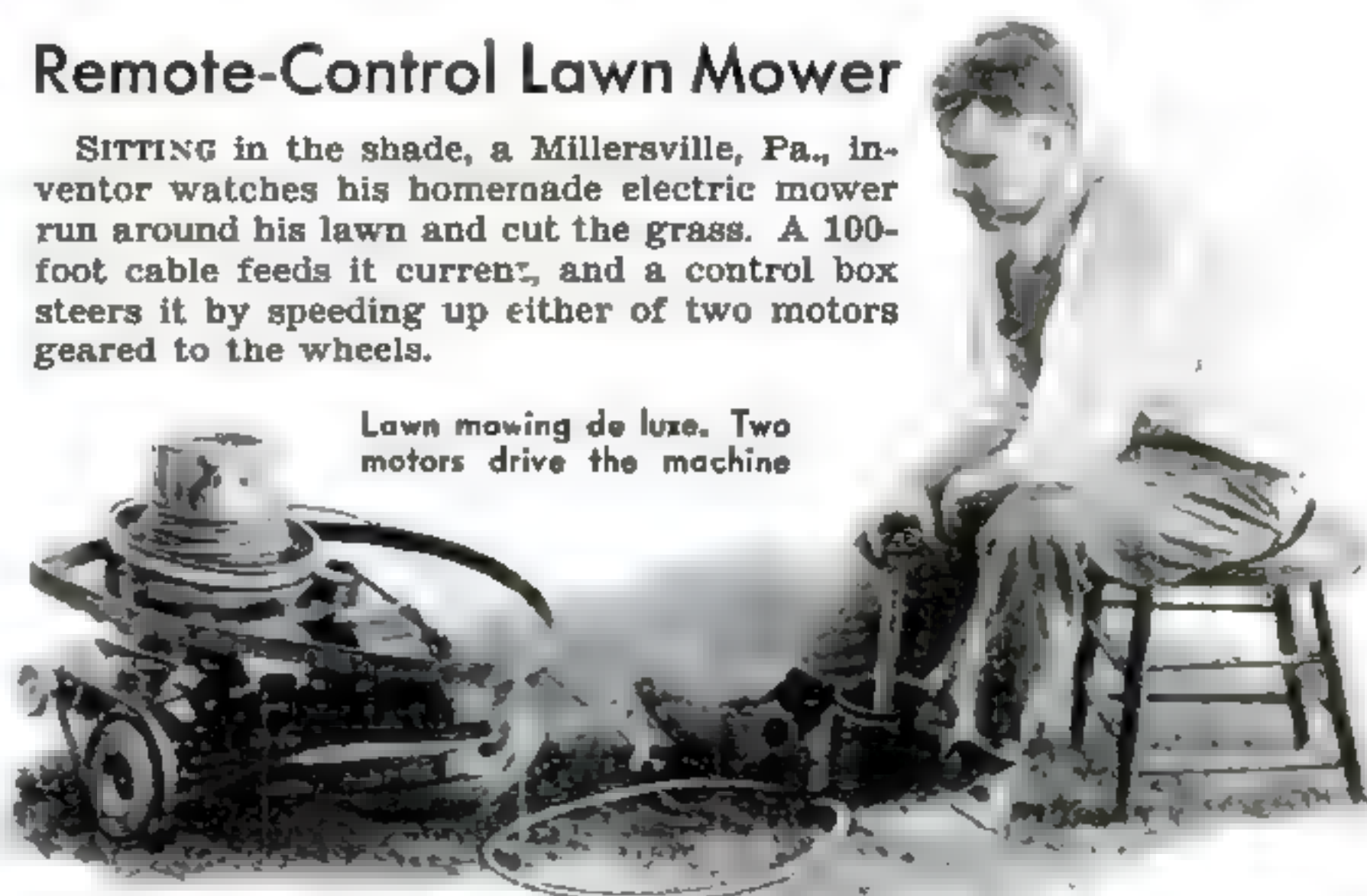
## Rifle Bullets Checked by High-Speed Camera

How a bullet behaves after it leaves a rifle is revealed by shooting it from a gun electrically wired to a high-speed camera, in one of the exacting tests that .22 caliber ammunition must pass at the Bridgeport, Conn., factory of a leading arms manufacturer. A bullet that turns over in flight, for example, loses speed and might make a large hole in a target and spoil a shooter's score. In contrast, the photograph at the left shows the flight of a well-made bullet speeding in a perfectly steady path toward the bullseye.

## Remote-Control Lawn Mower

SITTING in the shade, a Millersville, Pa., inventor watches his homemade electric mower run around his lawn and cut the grass. A 100-foot cable feeds it current, and a control box steers it by speeding up either of two motors geared to the wheels.

Lawn mowing de luxe. Two motors drive the machine



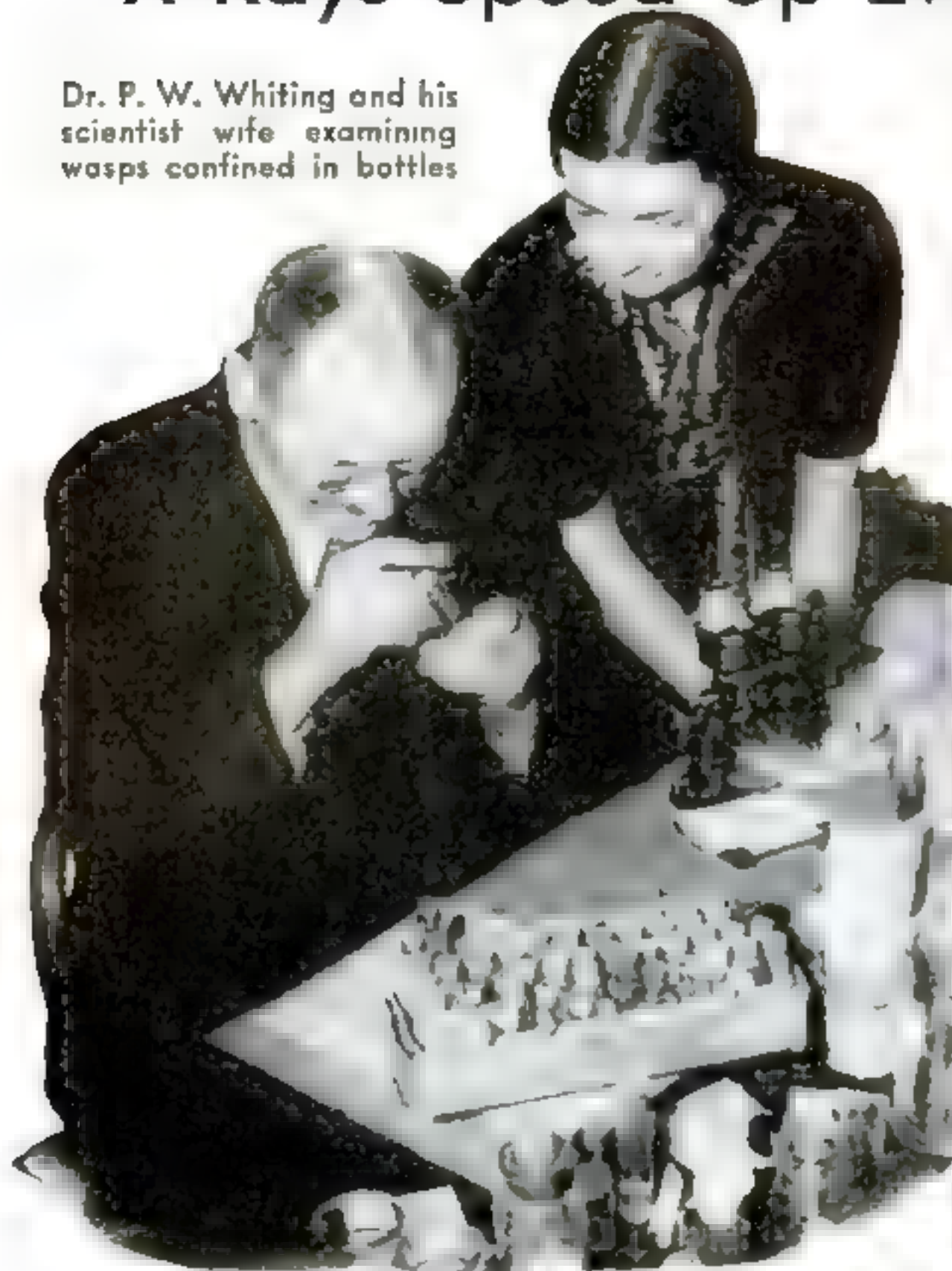


# X Rays Speed Up Evolution in Odd Tests with Wasps

Dr. P. W. Whiting and his scientist wife examining wasps confined in bottles

IS EVOLUTION brought about by radiations from the atmosphere? Some light may be shed on this scientific theory through experiments at the Philadelphia laboratory of Dr. Phineas W. Whiting

and his wife, University of Pennsylvania biologists, who have been bombarding wasps with X rays in an effort to speed up the gradual process of evolution and produce radical changes in insect strains. By exposing wasps to X-ray emanations before they were mated, the scientists have already produced curious mutations, or hereditary physical changes, in the offspring—wasps with six instead of four wings, and wasps with legs instead of antennae growing from their heads.



At right, Mrs. Whiting is using a binocular microscope to make an enlarged drawing of one of the insect subjects. Oval, wasps being stored



## Built-in Bookrests

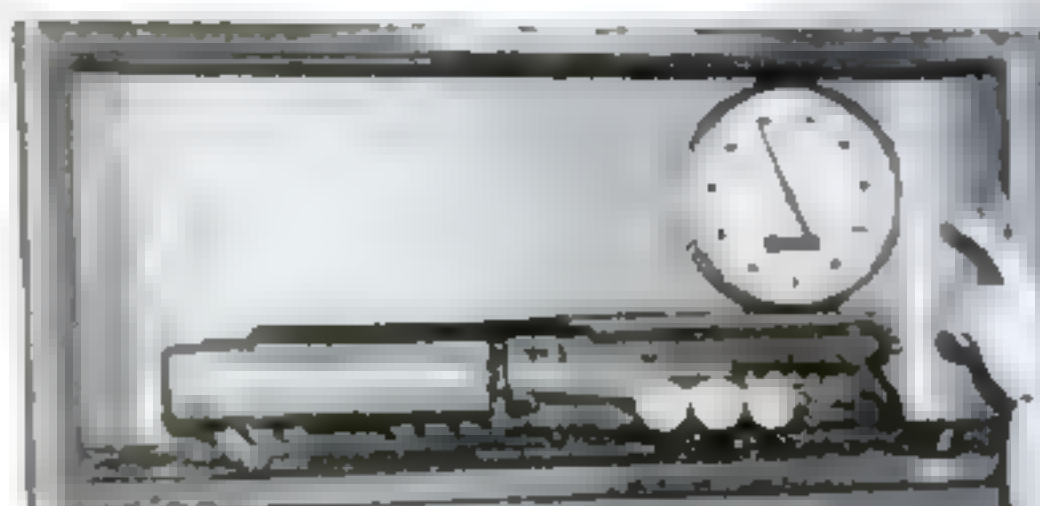
GLUED to the inside covers of a book, novel cardboard rests invented by Prof. Ramsay Harris, of Ontario, Calif., unfold to hold the book in the proper position for easy reading. Made in separate strips that are joined together with adhesive tape, the bookrests lie flat against the inside covers when the book is closed.



How cardboard easels fold into book cover

## New Train Has Speedometer for Passengers

PASSENGERS in a lounge car of the new, streamline Twentieth Century Limited can tell at a glance the actual speed of the train by looking at a built-in speedometer. As shown at right, the instrument is set into the wall above a model of the new locomotives used to haul the famous New York—Chicago express. An odometer set into the dial shows the mileage covered on each trip of the famous train.



By glancing at this instrument, passengers can see how fast a train is going



## Marking Screws Spot Holes for Metal Parts



Screws being set to mark drill centers for a new part

FOR replacing a worn or broken metal part, marking screws now available simplify the problem of transferring the exact positions of hole centers and drill circles in the work. Fitted with projecting points at their centers, the marking screws are inserted in holes in the old part, which is then laid over the new and tapped with a hammer. Impressions made by the projecting screw points are left in the new work to serve as guides for drilling.



# THE ESKIMOS HAVE A WORD FOR IT

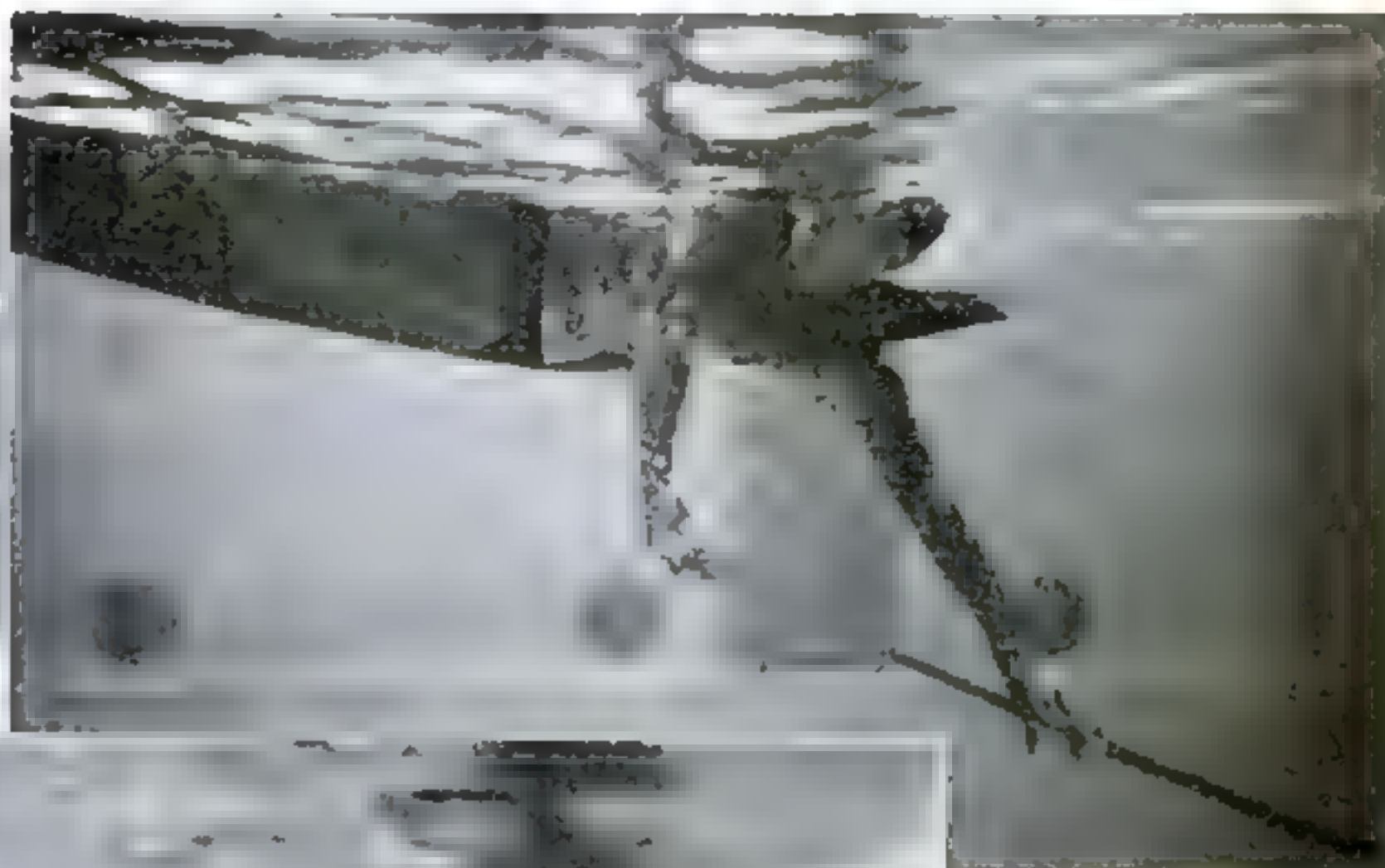
## Rolling a Kayak

Anybody can capsize a kayak, but it takes an expert to come back up



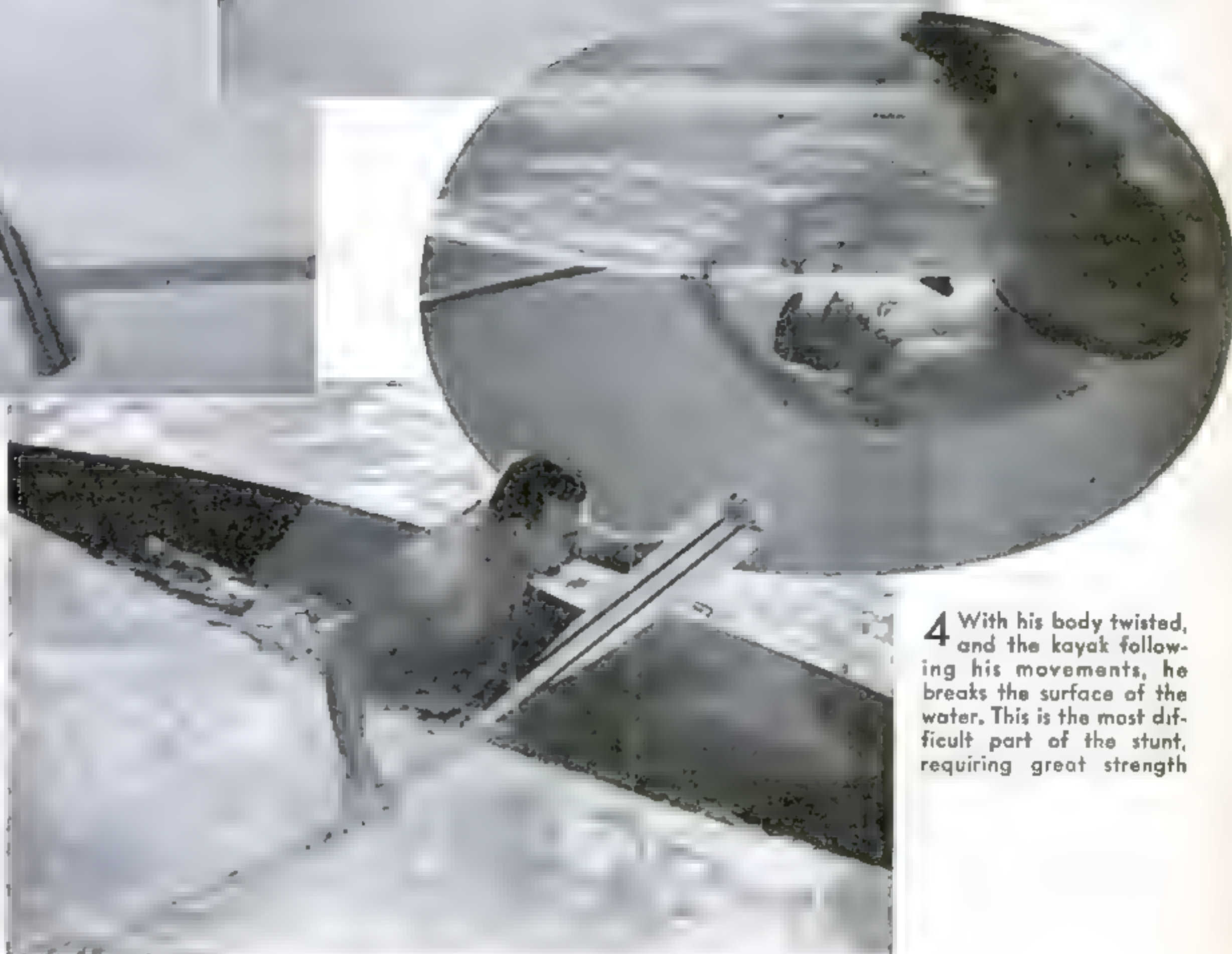
**2** Now upside down in the water, the man keeps the boat turning over by "feathering" the blades, or turning them sideways between strokes. An apron fastened tightly around his waist keeps water out of the kayak

**5** Right side up again. His body dripping, he regains his delicate balance. During the maneuver, which takes but a few seconds, a nose clip keeps water out of his nostrils



**1** Underwater views, taken in a swimming pool, show how Eskimos "roll" a kayak. A deep, sideward pull of the paddle turns the boat over

**3** Using the paddle as a lever, he gradually pulls himself toward the surface on the opposite side from where he went under, to complete the revolution



**4** With his body twisted, and the kayak following his movements, he breaks the surface of the water. This is the most difficult part of the stunt, requiring great strength



# POPULAR SCIENCE

## Question Bee

Try to sift the facts from the foolishness in the numbered questions below. In each, only one of the suggested answers is correct; the others are just camouflage. Make a note of the letter corresponding to the answer that you believe to be correct in each case. Then turn to page 98 and compare your results with the list given there and score yourself accordingly.



**1** When a butterfly collector makes a catch, he places it in a (a) stuffing box (b) cyanide jar (c) grease cup (d) Faraday cage (e) hydraulic press.

**2** A solstice is (a) a pilot's first flight alone (b) an agreement to suspend hostilities in warfare (c) a time of year when the sun reaches its farthest point north or south of the equator.

**3** To distill a liquid, it must be brought to its (a) flash point (b) burble point (c) vanishing point (d) boiling point (e) exclamation point.

**4** Glaciers leave deposits called (a) ground swells (b) tundras (c) moraines (d) Voltaic piles.

**5** Your eyes see things with the aid of sensitive (a) cubes and pyramids (b) rods and cones (c) stars and crescents.

**6** A screw can be driven into hard wood more easily if you (a) file off its point (b) rub soap on its threads (c) keep it heated with a blowtorch.

**7** A negatively charged electric terminal is called a (a) pentode (b) geode (c) cathode (d) nematode.

**8** Crosshatching is (a) breeding animals of different species to produce a hybrid (b) a method of shading used by draftsmen (c) what sailors use to batten down hatches.

**9** "High-speed steel" gets its name from the fact that (a) it is suitable for fast-cutting tools (b) it is manufactured by a practically instantaneous process (c) it has been developed especially for speedy streamline trains.

**10** Primitive people exchanged messages by means of (a) sky writing (b) form letters (c) pictographs (d) continental code (e) flower language.

**11** One of our showiest birds, with its conspicuous red and black plumage, is the scarlet (a) onager (b) tanager (c) pillager (d) dowager.

**12** It is considered a mark of good car driving to (a) use the reverse gear as a brake (b) sound the horn at all railroad crossings (c) set the car in motion by engaging the clutch with a quick, decisive snap (d) pull in to the curb backward when parking in a cramped space.

**13** Artifacts are often found in (a) volcanoes (b) Indian mounds (c) inaccurate news reports (d) a state of suspended animation.

**14** Iron coated with zinc is called (a) japanned (b) galvanized (c) Harveized (d) vulcanized.

**15** Bench marks are used by (a) woodworkers (b) machinists (c) judges (d) surveyors.

**16** Aqua regia is (a) a soothing lotion for use after shaving (b) a fuming mixture of acids that will dissolve gold (c) a brandy distilled from the fermented juice of the century plant (d) the name for all navigable waters under the domain of the King of England.

**17** The movable keel of a sailboat is called its (a) surf board (b) sea-board (c) sounding board (d) center-board (e) ouija board (f) punch board.

**18** You can regulate an electric current with a (a) metronome (b) comptroller (c) rheostat (d) tripod socket (e) pyloric valve (f) Pitot tube.

**19** An electric fan makes you feel cooler by (a) reducing the humidity (b) lowering the temperature of the air (c) evaporating perspiration more rapidly.

**20** The focusing screen of a camera is made of (a) smoked glass (b) ground glass (c) stained glass (d) spun glass.

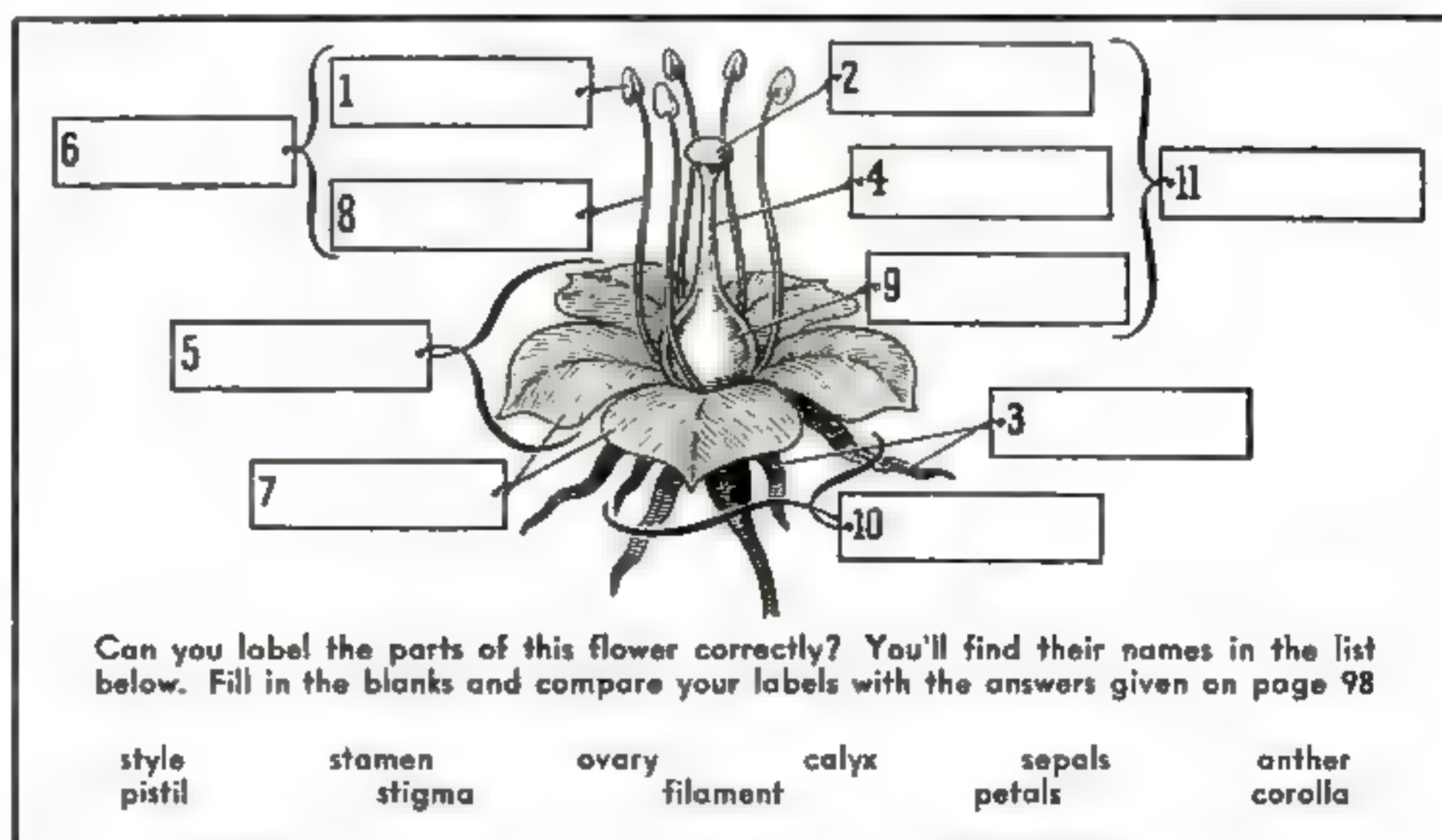
**21** A mad dog's bite may transmit (a) hypochondria (b) claustrophobia (c) hydrophobia (d) megalomania.

**22** A Geiger counter (a) keeps food refrigerated in a delicatessen store (b) counts visitors to public buildings with an electric eye (c) shows the revolutions per minute of a rotating shaft (d) measures radiations like those of radium.

**23** A grid leak in your radio set (a) should be plugged with solder before dripping acid damages your furnishings (b) is caused by a short circuit, which should be located and eliminated (c) maintains the grid voltage at a desired average value.

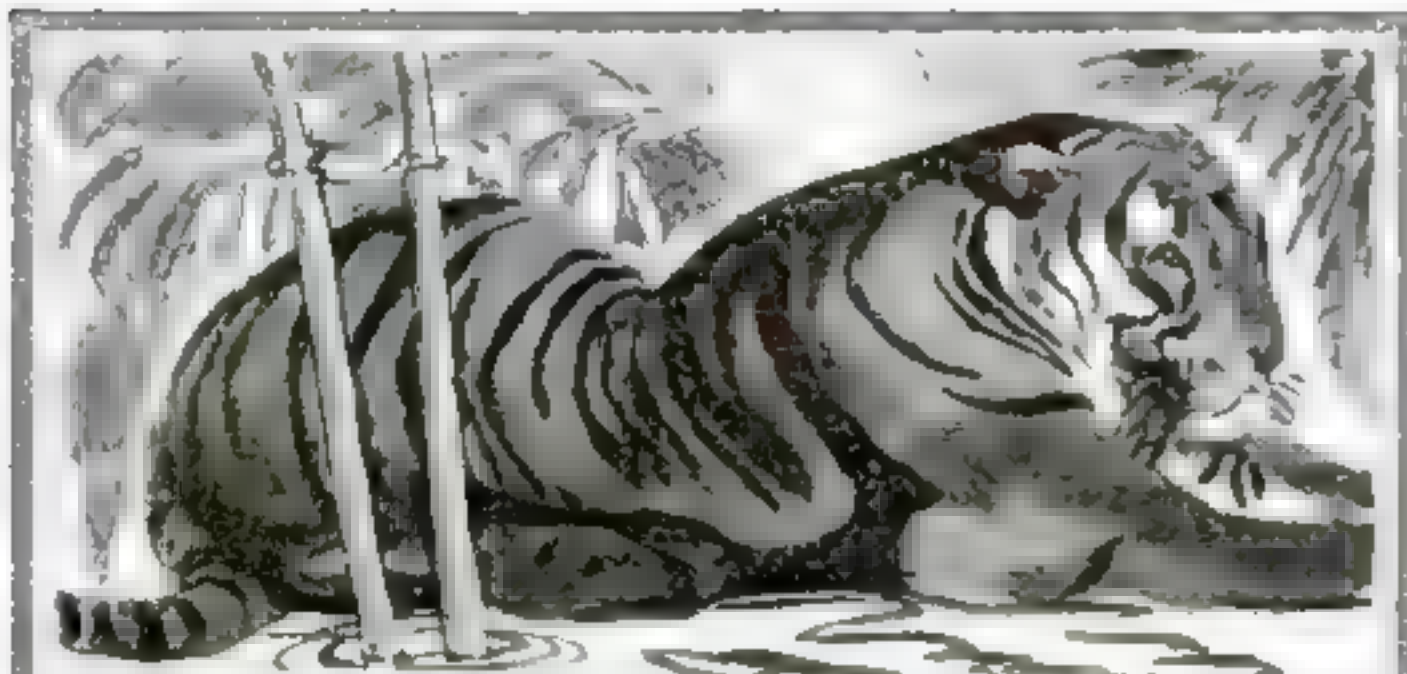
**24** Divers suffering from the "bends" are rushed to a (a) lethal chamber (b) pump chamber (c) decompression chamber (d) cloud chamber.

**25** You would look in an ephemeris to find out (a) who is ringing your doorbell (b) where Cambodia is (c) when the next eclipse of the sun will occur (d) whether the back of your new suit fits you.





# Un-Natural History By GUS MAGER



**TIGERS ARE FOUND BOTH IN THE STEAMY JUNGLES OF THE TROPICS AND ON THE ICY HEIGHTS OF THE HIMALAYAS! BUT THEY ARE NEVER NATIVE TO TEMPERATE REGIONS!**



**THOUGH SHREWS ARE THE SMALLEST MAMMALS ON EARTH, THEY ARE ALSO THE MOST FEROCIOUS! IF TWO ARE CONFINED TOGETHER, THEY WILL FIGHT UNTIL ONE HAS KILLED AND DEVoured THE OTHER!**



**THE ELECTRIC CATFISH OF AFRICA GENERATES ITS CURRENT IN ITS GLANDULAR SYSTEM! IT LIVES ON FOOD VOMITED BY OTHER FISH WHICH IT SHOCKS!**



UNDER-SIDE

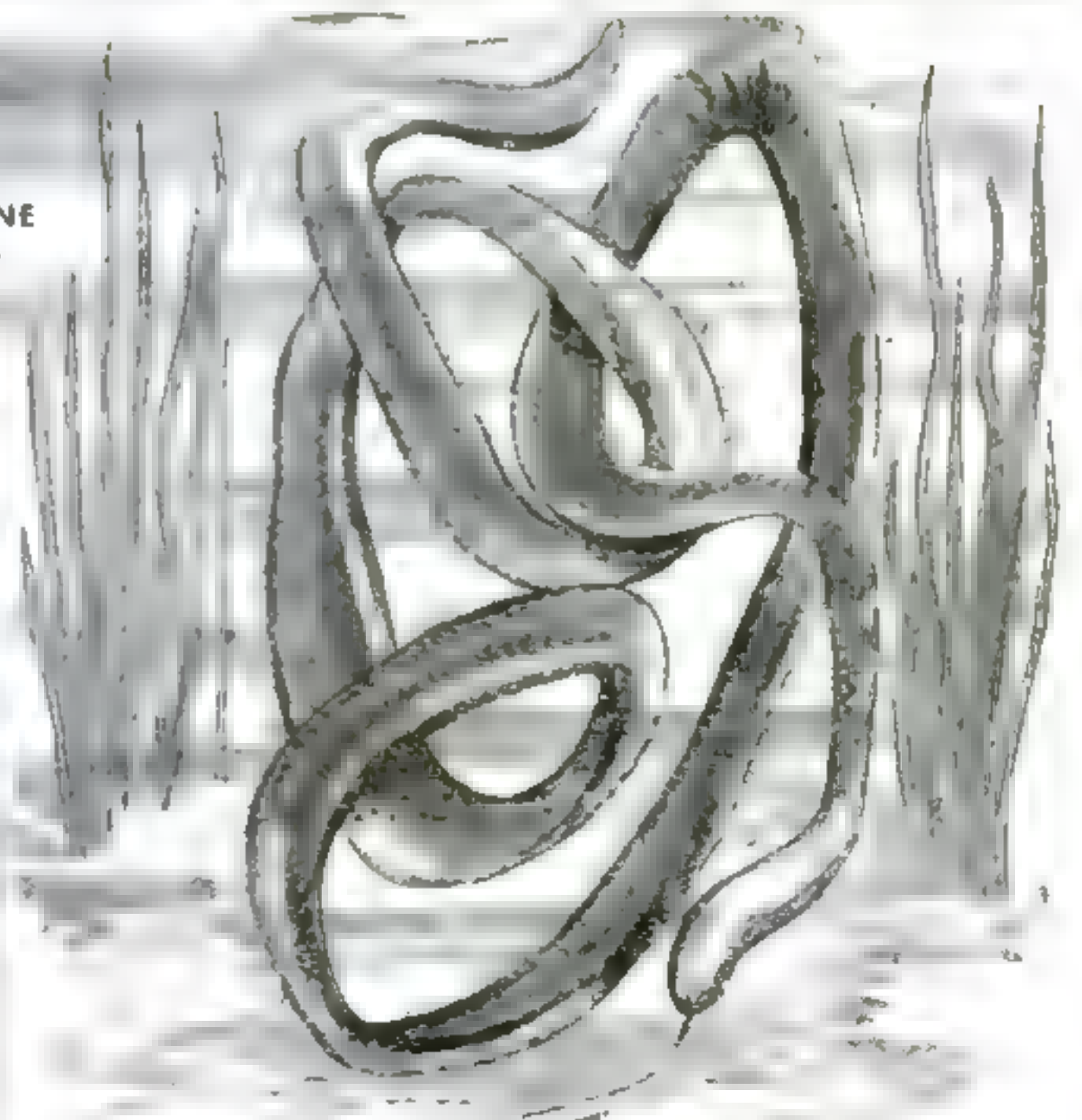
**HERE'S A WORM WITH A FUR COAT! THE SEA MOUSE, A MARINE WORM, HAS ITS UPPER SURFACE COVERED WITH LONG, GRAYISH HAIRS THAT HELP TO HIDE IT FROM ITS ENEMIES!**



POISON SAC

THE SACRED POISON IS IDENTICAL WITH THE VENOM FANG OF A SERPENT!

**SOME OF THE BEAUTIFUL CONE SHELLS CARRY POISONED DAGGERS FROM WHICH THEY CAN EJECT A VENOM MORE DEADLY THAN THAT OF A RATTLESNAKE!**



**CERTAIN FLAT WORMS BEGIN LIFE AS MALES, AND LATER DEVELOP FEMALE CHARACTERISTICS! OTHERS REPRODUCE BY SIMPLY DIVIDING INTO SEVERAL PIECES!**



# Handy Aids for



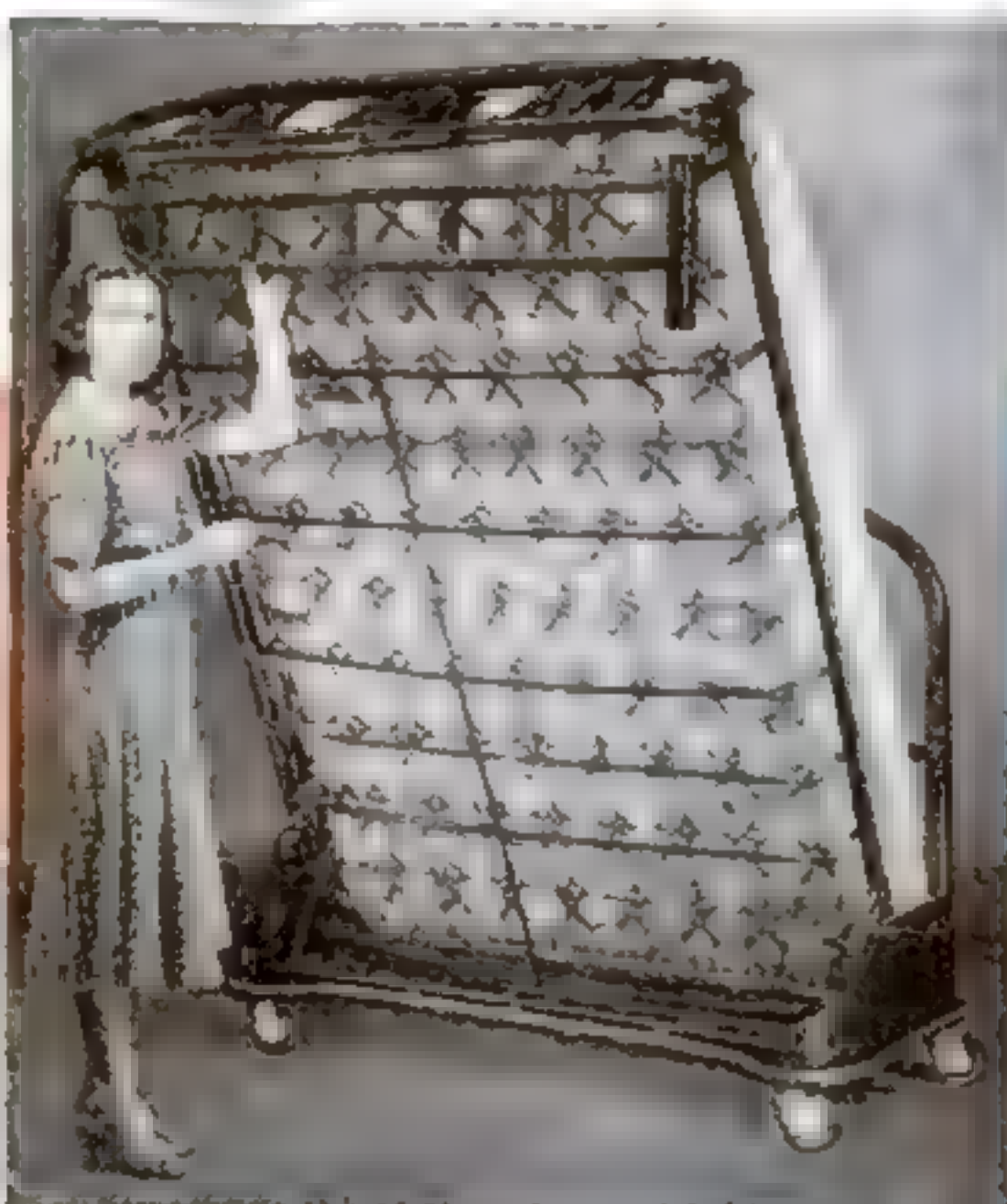
**TRANSPARENT BAGS FOR TRAVELERS**  
Made of cellulose wrapping material, transparent bags keep a traveler's toilet articles and small wardrobe items clean and shipshape while revealing their contents without unwrapping. The largest size accommodates a pair of shoes, while the smallest takes a toothbrush

## FLOOR CONDITIONER

Care of highly polished wood and other floor surfaces is made easy by a new inexpensive electric home unit. In addition to the machine, the outfit includes wax, filler, cleaner, sandpaper and buffing disks, steel-wool doughnuts, felt pads, brushes, and a manual of instruction



**FOLDING BED.** Only twenty-seven inches of storage space is required by the bed at the right when it is folded up as shown. Roller casters make it easy to move behind drapes or into a closet when not in use. Clamps hold the bedding in place



**DOUBLE-DECK MATTRESS.** Two layers of coil springs give extra comfort to the mattress pictured below. The lower deck acts in the manner of a single mattress, while the upper deck conforms to every curve of the user's body. The window in the mattress below shows construction



**WASHING MACHINE IS RUN BY VACUUM CLEANER.** Hitched to this ingenious washing machine, any vacuum cleaner will do the family wash. Set in a bathtub as illustrated, the washer is fitted with a turning arm that is operated by suction from the cleaner



# the Homemakers

**CELLULOSE DOILIES.** Transparent moisture-proof doilies of cellulose film, printed with attractive designs, are both practical and ornamental for summer table settings like that seen below. Easily wiped clean with a damp cloth, they can be used over and over again



**TIME FOR THE NEXT DOSE** of medicine is shown by the ingenious prescription-bottle cap pictured below. A steel ball, moved in a ribbed groove of the molded-plastic cap indicates the hour or half hour when a dose is due



**ELECTRIC SAUCEPAN.** Sunk below the surface of a new electric range, a special heating compartment accommodates a saucepan which receives heat from the sides as well as from the bottom, thus speeding up boiling, steaming, frying, and other operations



**SLIDING FIRE SCREEN.** At a mere touch of the poker, this built-in fire screen slides up into a recess above the fireplace opening. Made of fine bronze screening that does not obstruct the firelight, it is counterbalanced by weights like a window



**VACUUM-CLEANER CORD CONTROL.** Awkward dragging of the cord is eliminated by a device now supplied with several makes of vacuum cleaners. A reel built into the handle feeds out cord as it is needed, and whisks it back at a finger's touch



# Gus Tunes a Car by Ear

By MARTIN BUNN

"THERE'S something in the Bible about it—or maybe it's in Shakespeare," Gus Wilson told Harry, the young mechanic. "It goes something like this: 'Ears have they, but they hear not.' You're a funny guy, Harry. You'll listen in on one of those radio moaners for three minutes, and all the rest of the day you'll drive me nuts singing the tune. But you'll listen to an automobile engine sputtering and missing and knocking, and then, by golly, you have to take it half apart to find out what's ailing it. Learn to use your ears, son—they're standard equipment on your model, and you need them in this business!"

Harry grinned at his employer. "Take it easy, boss," he said. "I'm just a young feller trying to get along in a tough world! Now, you—I suppose you could sit in there in the office, with your feet up on Joe Clark's desk, and if some one drove into the shop in a job with its motor missing, you could just tune in on it with your ears and spot the trouble without even taking your feet down and tossing a look at it!"

"Maybe I could," Gus admitted placidly. "Want to bet me two bits I can't?"

"No, I'm not ever going to bet you on anything ever again," said Harry hast-

ily, aware from bitter experience that wagering with his boss resulted in holes in his weekly pay. "But I still don't think that you can do it—except maybe by a lucky shot in the dark once in a couple of hundred times."

"Well, we'll see," Gus said. "I've got to keep things up to date in the office for Joe while he's away—although all the thanks he'll give me is to say that I've balled up his accounts. I'll be in there for an hour or so, and if some one brings in a car with its engine missing, maybe I'll be able to show you why the good Lord gave automobile mechanics ears."

While he wrote out time-and-material slips in his big, sprawling hand, Gus kept his ears open to what was going on in the shop. First, Mrs. Miller drove up to the door to leave a tire to be repaired. When Harry sent her on her way laughing, after wasting only five minutes listening to her chatter, Gus grinned his satisfaction and decided that his assistant was coming along nicely in the art of diplomacy.

A half hour later, careful George Knowles drove up, and Gus heard him tell Harry that there must be something wrong with his car's clutch. It was making a lot of noise. Perhaps the bearing had run dry. Harry climbed in, disengaged the clutch, and raced the motor. The noise persisted. "That proves that it isn't the clutch," Gus heard him say. "Keep your engine

running, please, while I take a look." Silence for a few moments, then Harry's voice again, now with a note of triumph in it. "It's the fan belt, Mr. Knowles. It's slipping, and the metal hood deflects the noise and makes it sound as though it's coming from the clutch. I'll tighten the belt for you. No, you won't have any more trouble with it." Then Knowles drove away. Yes, Harry was learning fast!

Gus was just finishing his bookkeeping job when another car was driven into the shop. Over the smooth purr of its idling engine he heard a woman's voice, and Harry's louder replies. Then the engine was speeded up, and it began to pop. Gus's experienced ear caught a sort of regular irregularity in its rhythm. "Couple of cylinders firing when they shouldn't be," he thought. Then the engine was allowed to idle again, and it resumed its smooth purr.

Harry stuck his face through the office door, grinning. "It's the woman who just moved into that big new house down the road—Mrs. Oliphant, she says her name is," he told Gus in a whisper. "She's got a honey of a car, with less than ten thousand on the speedometer, and she says that her engine starts missing every time she gets up above twenty miles. This would be a swell chance for me to call that bluff of yours about being able to tell what's wrong with a motor by just listening to it only I haven't the heart to show you up in front of a new customer. You'd better come out and take a look at it."

Gus leaned back in Joe's chair, hoisted his feet to the desk top, and grinned back at Harry. "I don't need to take a look at it," he said. "You take the distributor head off. You'll find a Y-shaped crack in it. Drill a hole right where the Y branches. Make the hole twice as big as the width of the crack. I'll be out in a few minutes."

"All right," Harry said. "But it sounds screwy to me."

Gus sat listening until he judged that Harry had the distributor head off. Then he went into the shop.

Harry was examining the distributor head, and his jaw was hanging. "It's got a Y-shaped crack in it, all right!" he muttered.

"Drill a hole in it, the way I told you," Gus said. While Harry was doing it, he turned to Mrs. Oliphant. "That hole will fix it so (Continued on page 97)

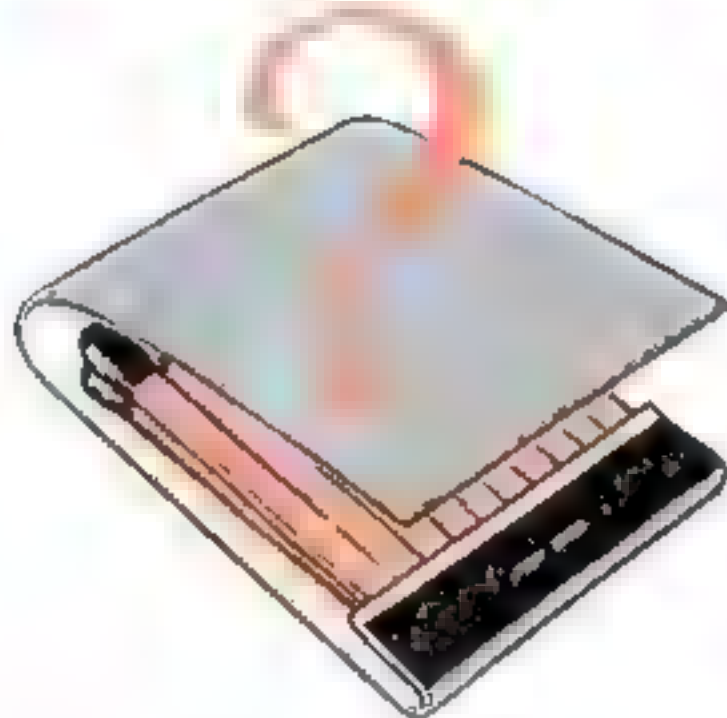


Harry stuck his face through the office door and whispered, "This would be a swell chance for me to call that bluff of yours!"



# THE HOME WORKSHOP

## WHAT CAN YOU MAKE FROM



## We'll Pay \$50 in Cash Prizes for Best Novelties Submitted

**R**EACH into your pocket for a book of safety matches and see if you can tear, cut, and bend it into an amusing novelty like one of those illustrated. Perhaps you can do even

better, although these are by that craftwork magician, Kenneth Murray. In any case, send us the best match-comic you make and try for one of the eight cash prizes, amounting to fifty dollars, we are offering to stimulate a little friendly competition among our readers.

Just to get you started, we'll tell you how Murray made the horse and rider. He tore out all but two safety matches at either side of the book. These he bent to form legs. Then he removed the cardboard flap so that the binding would serve as the horse's body. One match was pushed into one end to form the neck and head, and a shorter one was used for the tail. Finally, a match was split to make the rider, and another bent to form his arms.

Your friends will find this a lot of fun, too, so why not have a book-match party? If you wish, you can offer small prizes for the best ones made. Those who win can then enter their match-comics in our book-match contest.

### HERE'S ALL THERE IS TO ENTERING THE CONTEST

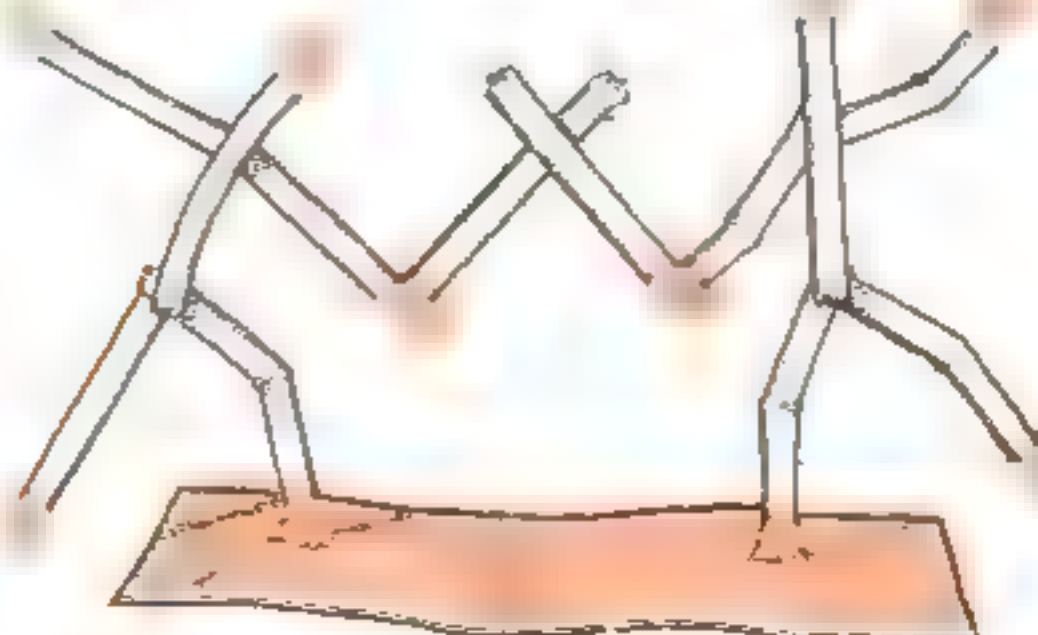
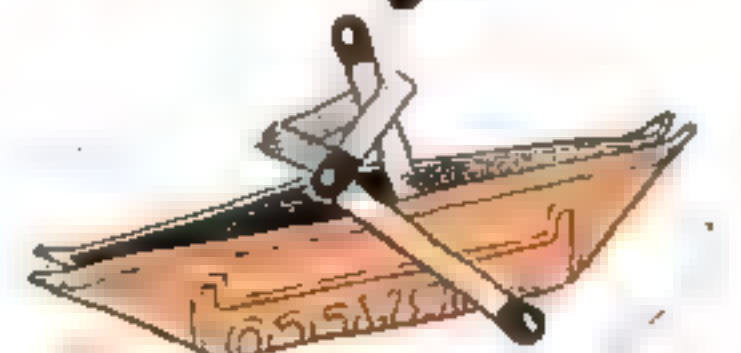
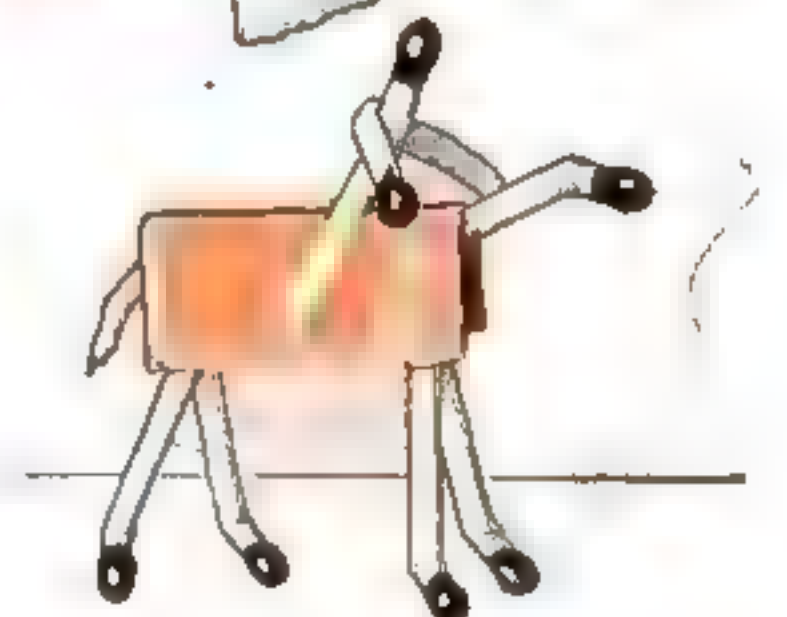
**F**OR the best match-comics received on or before October 1, 1938, Popular Science Monthly will award eight prizes as follows:

First Prize.....	\$25
Second Prize.....	15
Third Prize.....	5
Five Prizes, \$1 each.....	5

Each entry must be made from a single ordinary book of safety matches. No additional materials of any kind may be used except cement or glue for fastening parts together, but lines or markings may be added with black ink or colored paints. Only one entry may be made by each contestant.

Because of strict postal regulations governing the mailing of matches, each entry must be packed in a tightly closed metal box, such as an empty cigarette tin or tobacco can, and securely wrapped. Any entry that violates these requirements will be summarily rejected.

The contest is open to all except employees of Popular Science Monthly. Address each entry to the Contest Editor, Popular Science Monthly, 353 Fourth Avenue, New York. No entries will be returned. The judges will be the editors of this magazine, whose decision will be final. In case of ties, each tying contestant will be awarded the prize tied for.

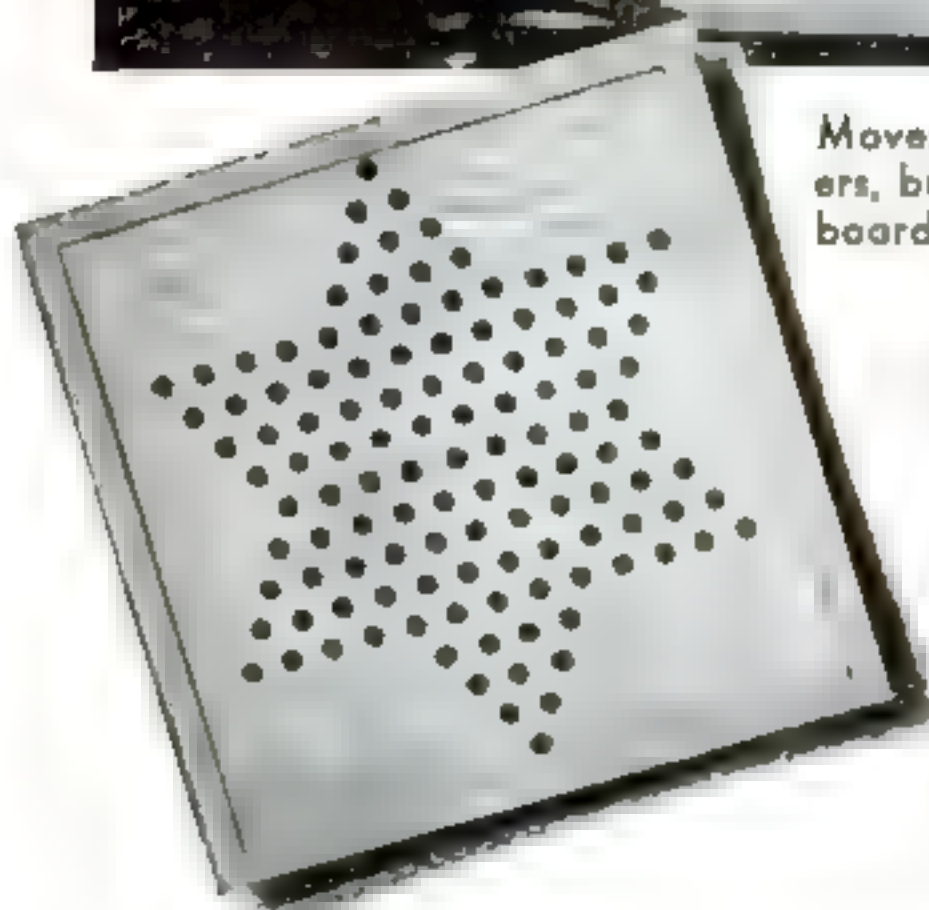


Five suggestions: a tongue-popping face, horse and rider, boat, tortoise, and fencers





Moves are made as in ordinary checkers, but no pieces are removed from the board. Right, drilling the marble holes



## Chinese Checkers

The holes are arranged to form a star design. A convenient size to make the board is 20 in. square

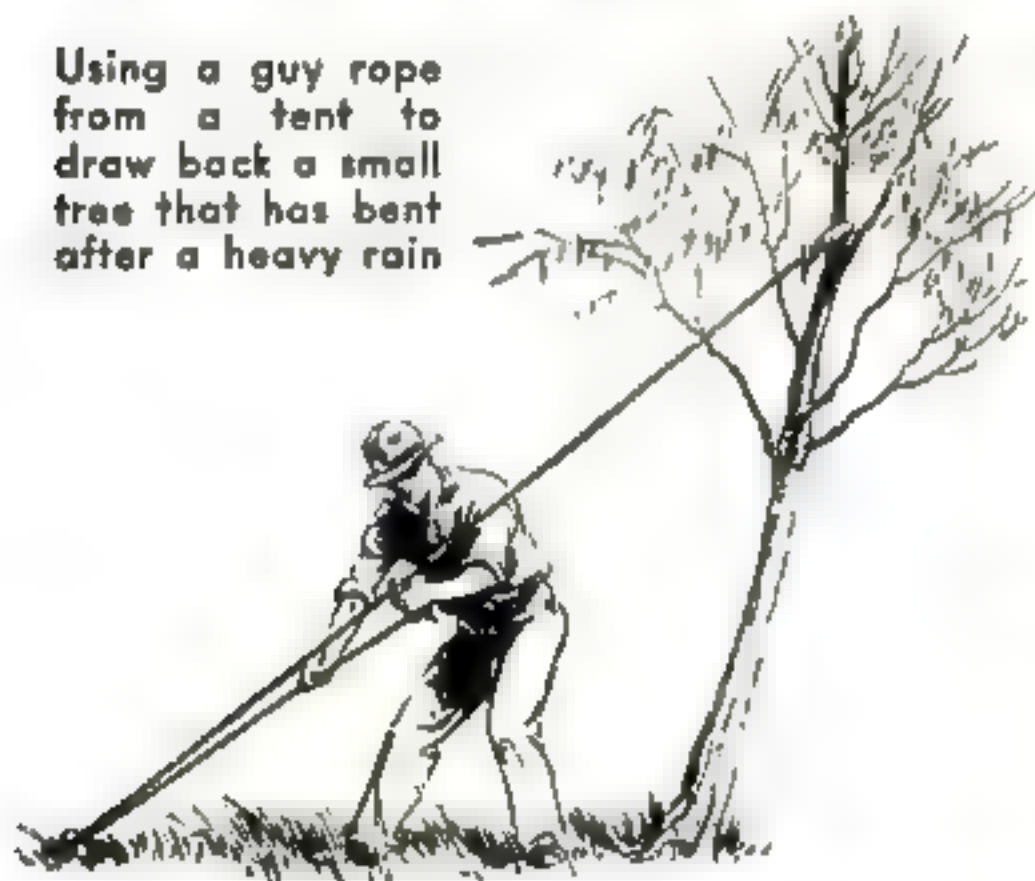
square plywood with  $\frac{3}{4}$  by  $\frac{1}{2}$ -in. rabbeted strips of wood around the edge. Lay out the six-pointed star and drill the 121 holes,  $\frac{1}{2}$  in. in diameter. Sand the board and varnish or shellac it.

Sixty common glazed marbles, in lots of ten of a color, are required. One set is placed in the ten holes that form a point

of the star in front of each player. The player who is first to move all his men by successive jumps to the point of the star directly opposite is the winner. The marbles may be moved in any direction on a line, and the player may jump his own or other marbles, but jumped marbles are not picked up.

FROM two to six persons may play this new game, which goes by the odd name of "Chinese checkers" in the Middle West. The board may be heavy cardboard, plywood, or pressed composition wood. The one shown is 20-in.

Using a guy rope from a tent to draw back a small tree that has bent after a heavy rain



## Tent Guy Rope Straightens Small Tree after Storm

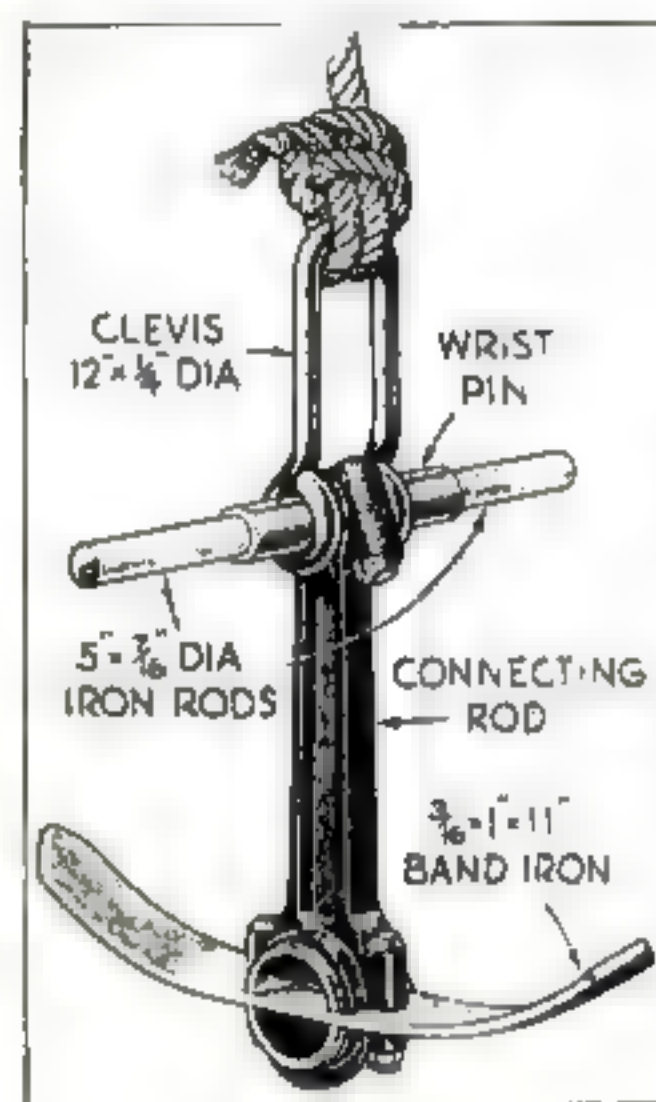
WHEN a small tree bends over in a storm, it may often be straightened by using a rope, tent peg, and guy-rope tightener. As the rope becomes loose, tighten it again, and continue until the tree is straight.—F. C.

## Building Model Railway Cars

A GLASS cutter forms an excellent scribe for marking out the boards on the cardboard sides of model railway cars. When small flat cars are being built, match sticks may be used for making all the small stakes.—A. L. D. F.

## Light Anchor Made from Connecting Rod

BY UTILIZING an old automobile connecting rod—in this case, one from a model-T Ford—it is possible to assemble a lightweight anchor for a small boat as shown below. The flukes are made from band iron, but the points should not be bent up any more than shown. The two 5-in. long iron rods must be a tight drive fit in the wrist pin.—J. M. A.



This easily assembled anchor for a small boat weighs about 3 lb. if made the size shown

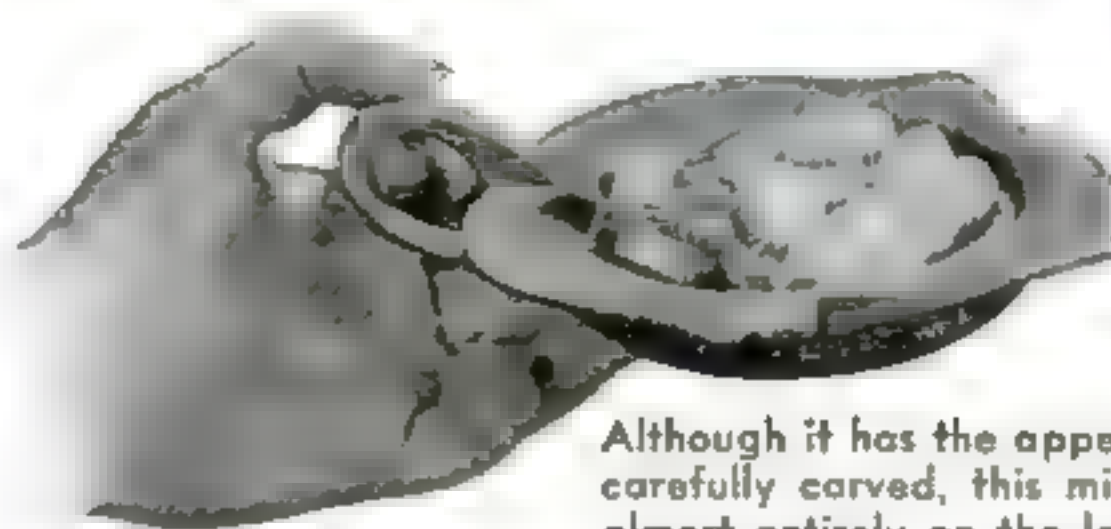
## A Leaf-Shaped Mint Dish or Ash Tray

THE and scroll-saw work are combined in this leaf-shaped dish, which may be used either as a mint dish or an ash tray. If it is to serve as an ash tray, obtain a glass ash tray or coaster from 3 to 3 1/4 in. in diameter so the hollow portion of the dish may be turned to fit.

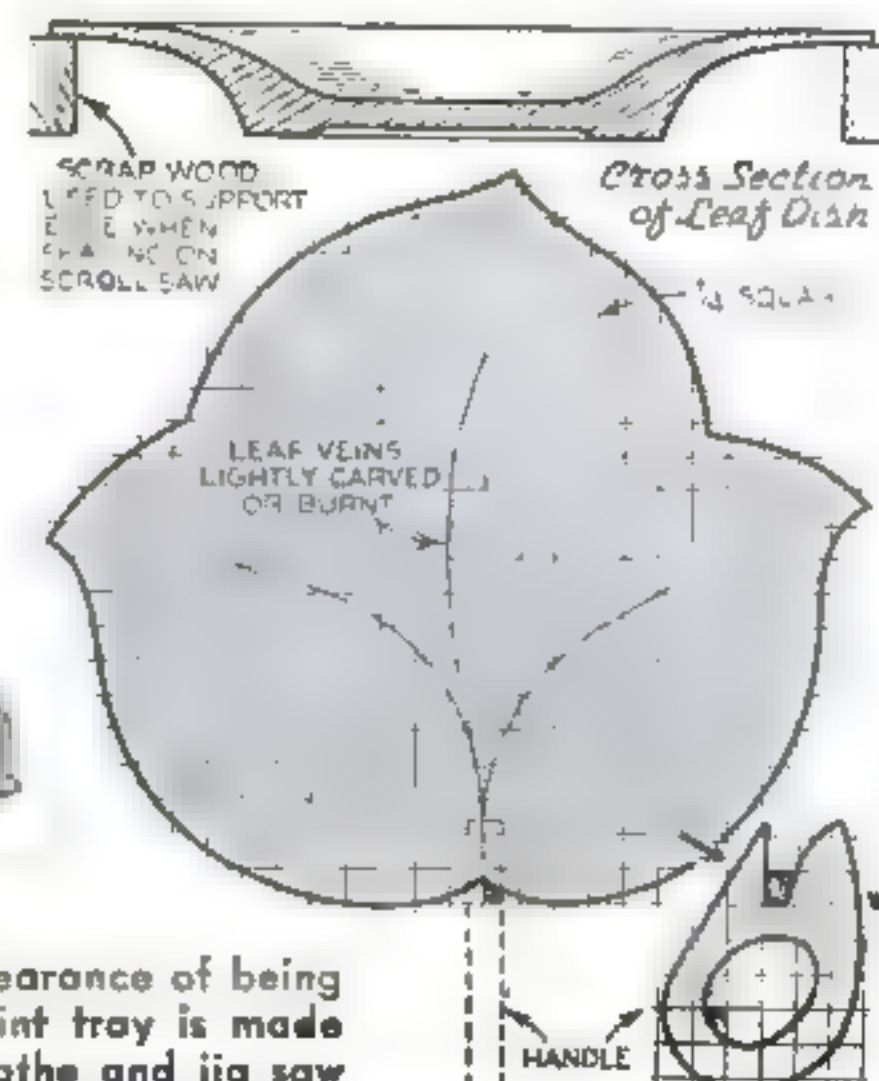
The only materials required are a 6-in. disk of 1-in. clear-grained maple and another piece  $\frac{1}{4}$  by 1 1/2 by 2 in. A simple way to turn the dish is with a screw center. If a small screw is used and the hole is filled with plastic composition wood, the leaf vein will nearly conceal it. Turn and sand the bottom first. Reverse the dish on the screw center and turn and finish the upper side. Then draw the leaf outline on the top. Prepare a 6 1/4-in. disk of soft wood  $\frac{3}{8}$  in. thick, and cut a 5 1/4-in. circle from the center. Use this ring to support the edges of the dish while you cut it on the scroll saw. Cut a handle from the  $\frac{1}{4}$ -in. maple to fit the dish.

The handle is attached with glue and  $\frac{3}{16}$ -in. No. 20 brads, driven as shown by the arrows.

The veins of the leaf can be lightly carved or burnt with a pyrographic pen. Two coats of shellac, lacquer, or varnish, well rubbed and protected with a coat of wax, will give a satisfactory and durable finish. Felt may be glued on the underside.—EDWARD J. HOBERT.



Although it has the appearance of being carefully carved, this mint tray is made almost entirely on the lathe and jig saw





# HOLLOW Sailboat Mast

ASSEMBLED WITH THREADED BRASS RODS

**A** LIGHTWEIGHT hollow mast of the type used on the racing sailboat *Blackcat*\* can be completely assembled with the aid of just one 4-in. C-clamp. While the mast shown in the drawings was designed for a slightly larger (16-ft.) boat, only a little alteration of dimensions is required to build one shorter or longer, as required.

Fir and spruce are suitable materials. When you have the four pieces dressed to size, chisel out the sidepieces at the point where the sheave will come. Metal plates,  $\frac{1}{8}$  in. thick, are mounted here with countersunk screws. The tips of the filler strips are cut off sufficiently to permit the insertion of the sheave, and a small block,  $\frac{1}{2}$  in. thick, is cut to take their place. One side and the two filler strips are then placed in position, and the three filler blocks are cut to fit.

Next obtain some waterproof casein glue and 12 ft. of  $\frac{1}{4}$ -in. threaded rod in short pieces, say 3 ft. long. Coat all surfaces to be joined with glue for about half the length of the mast, beginning at the masthead. Assemble and put the C-clamp at one end. Draw the tip up tight and with a drill slightly smaller than the threaded rod, bore a hole vertically down through the side-



Screwing the threaded brass rods through edges

pieces and filler strips. Set a short length of the

threaded brass rod in a hand drill or auger bit brace and screw it down through the hole until it comes flush on the other side. Saw off the surplus rod. Remove the C-clamp, re-clamp it on the other edge, and repeat the process. Place the rods along the edges on 12- to 16-in. centers. When

you reach the unglued section, spring the remainder of the mast apart and saturate the edges with glue.

Allow the mast to lie on a perfectly flat surface at least two days in dry weather. A coarse file can then be used to dress off the short, protruding ends of the brass rods. Round off the corners of the mast, set the sheave and stay tangs, and apply two coats of spar varnish.—K. F. KEITH.



The completed mast, which is shown on the nearer boat, is stepped so that it rakes back slightly—about 6 in.

\*For complete instructions and plans for the *Blackcat*, see "Racing Sailboat Blackcat" (Popular Science Publishing Co., Inc., New York, price \$1.00).



Assembled mast, the main pieces, and details of construction. Made of fir, it weighs only 55 lb. in comparison with 86 lb. for a solid mast



# New Sailing Rig

## GIVES CANOE GREAT SPEED

BUILT by a City Island, N. Y., canoeist, the novel sailing rig illustrated has proved fast and efficient. The 17-ft. canvas cruising canoe on which it is used is always up among the leaders in races for this type of craft.

The most important feature is the extension of the mainsail boom, to which the jib is attached. The extension holds the jib out when running before the wind, as both mainsail and jib swing together.

Other features include a loose-footed mainsail and roller-reefing device for the jib. Instead of being fastened all along the boom, the mainsail is attached only at the fore-and-aft points of the foot, which allows the sail to form a better pocket to catch the wind. The reefing device enables the jib to be rolled up on a dowel in a stiff breeze. These changes also minimize the chance that the various sheets will become tangled, and make both sails somewhat easier to handle.—WALTER GOTTLIEB.

## Repainting a Rowboat

BEFORE attempting to repaint a rowboat, scrape and scrub off all accumulations of marine growth and dirt, and let the hull dry thoroughly. It is no use applying paint over moist woodwork. Fill any open cracks and holes with calking cotton dipped in paste white lead or, if small, with white-lead putty.—V. J.

## Bicycle Speedometer Serves as Boat Log

A PATENT log for a boat may be made as shown from an old bicycle speedometer. The spinner, of  $\frac{1}{8}$ -in. brass or copper, is attached with about 50 ft. of heavy fishline. If only thin

brass is available, split a  $\frac{1}{4}$ -lb. sinker lengthwise and rivet to the spinner. To calibrate, establish a measured mile along the shore by consulting a surveyor's map, make a test run in both directions, and find the boat speed in miles per hour. By trial and error, give the spinner blades more or less twist until the same speed is registered on the dial. On long trips, especially out of sight of land, the log is handy for computing actual mileage, and is a prime requisite for navigation by dead reckoning.—J. E. GUY.



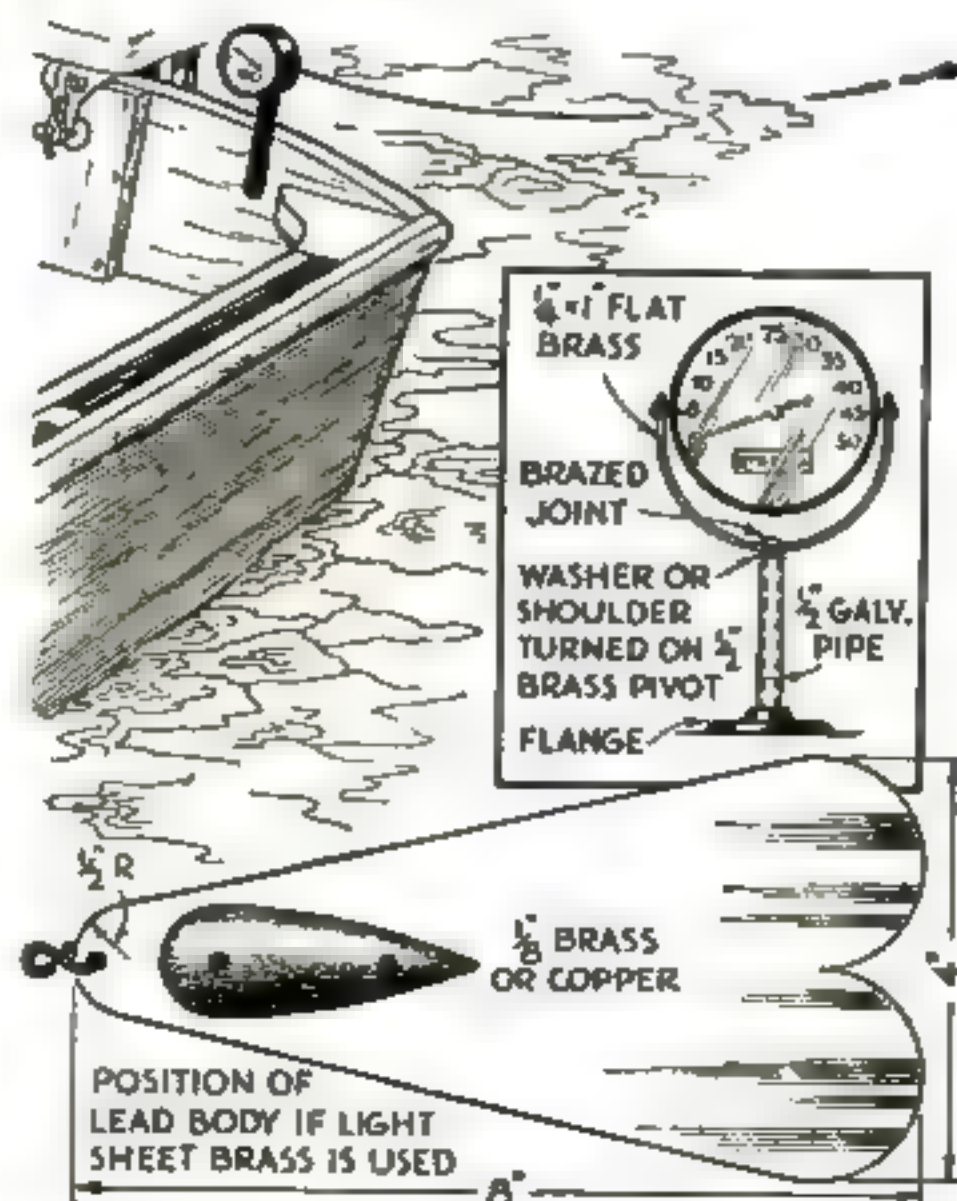
## Scale on Binoculars Aids in Focusing

IN PILOTING small cabin cruisers at night, many yachtsmen use binoculars to identify buoys, range lights, and other navigational markers. It is not easy, however, to steer a straight course with one hand and juggle the binoculars into clear focus with the other. To avoid this difficulty, I hit upon the following method:

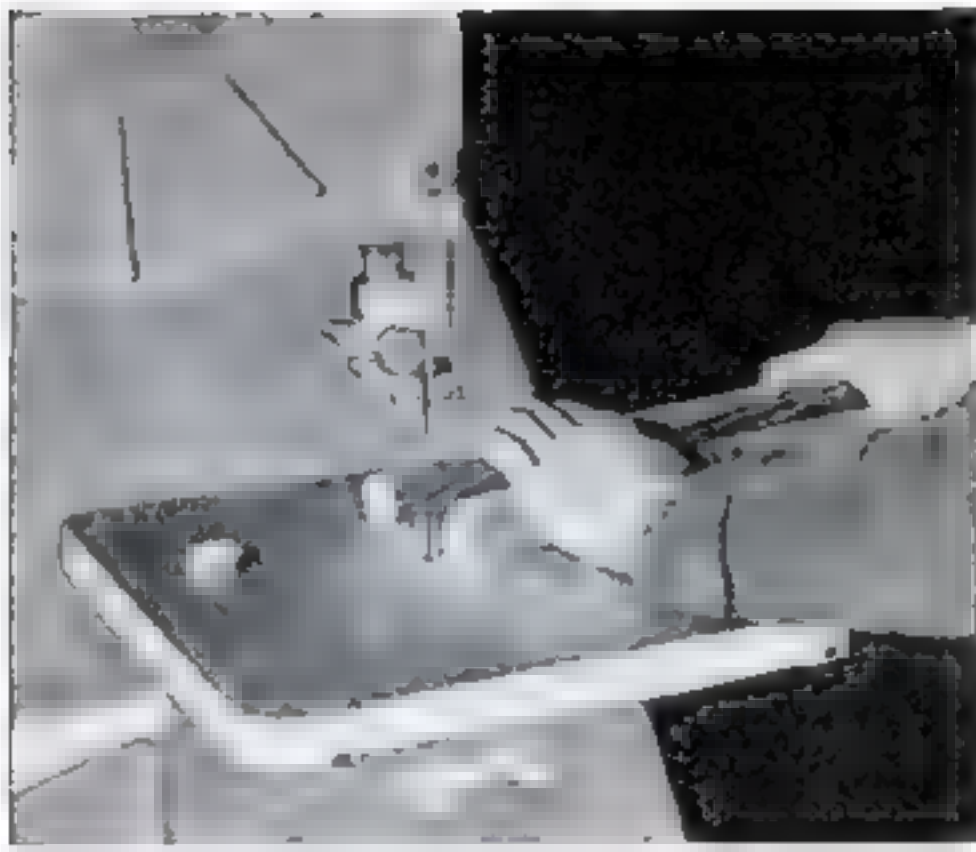
On a very clear day, I focused on objects at several convenient known distances, from 500 feet up to infinity. When each object was brought to a clear focus, an identifying mark was scratched on the sliding barrel next to the housing case, as shown. It is now a simple matter to hold the binoculars next to the binnacle light, twirl the adjusting screw, and set the focus to any desired distance.—F. K.



The speedometer may be fastened rigidly or, for greater accuracy, mounted so as to swivel







## V-Block for Band-Sawing Cylindrical Pieces

BAND-SAW blades are frequently broken when an attempt is made to cut a cylindrical or irregularly shaped piece of wood. That is because the piece has a tendency to roll quickly against the blade when the cut is started. The difficulty can be avoided by using a wooden V-block, as illustrated above, to serve as a cradle for the work and enable the cut to be controlled.—B. H.

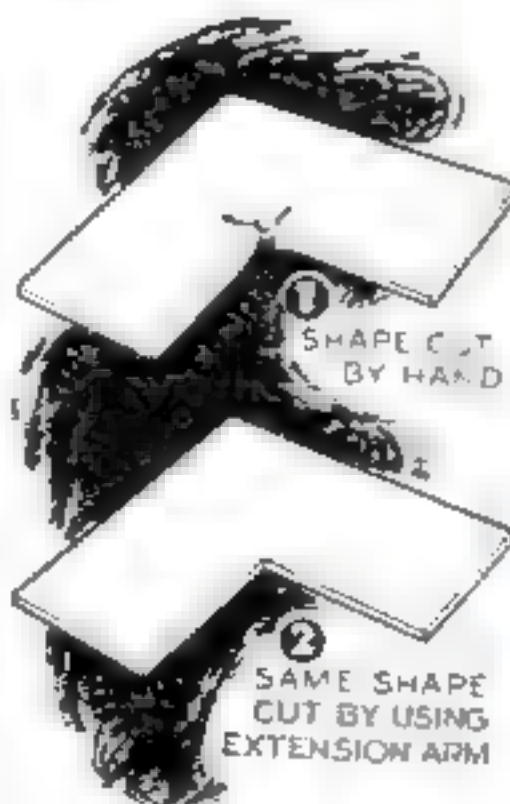


## Painted Dots and Dashes Identify Electric Wires

PRIMARY and secondary wires of unmarked transformers can be distinguished by using quick-drying lacquer to paint the International Morse Code letters P and S on the respective wires, or on the transformer near the terminals. The letter S is represented by three dots; the letter P by a dot, two dashes, and a dot. In a similar way, other telegraphic characters can be employed for marking purposes.

## Cutting Accurately with Tin Shears

WHEN a pattern has to be cut with tin shears in fairly heavy sheet metal, it is often difficult to relieve the pressure on the handles quickly enough to prevent overrunning the cut. If the shears are held as shown at the right and an extension arm is fastened to the upper handle with two bolts, the cut can be controlled much more accurately and positively because comparatively little pressure has to be exerted. Do not, however, use this set-up to force the shears to cut heavier metal than can be cut by the usual method, as it would ruin the shears.



The extension arm enables a cut to be stopped without overrunning

## Dog Bed Has Automatic "Don't Disturb" Sign

The weight of the dog makes the sign bob up

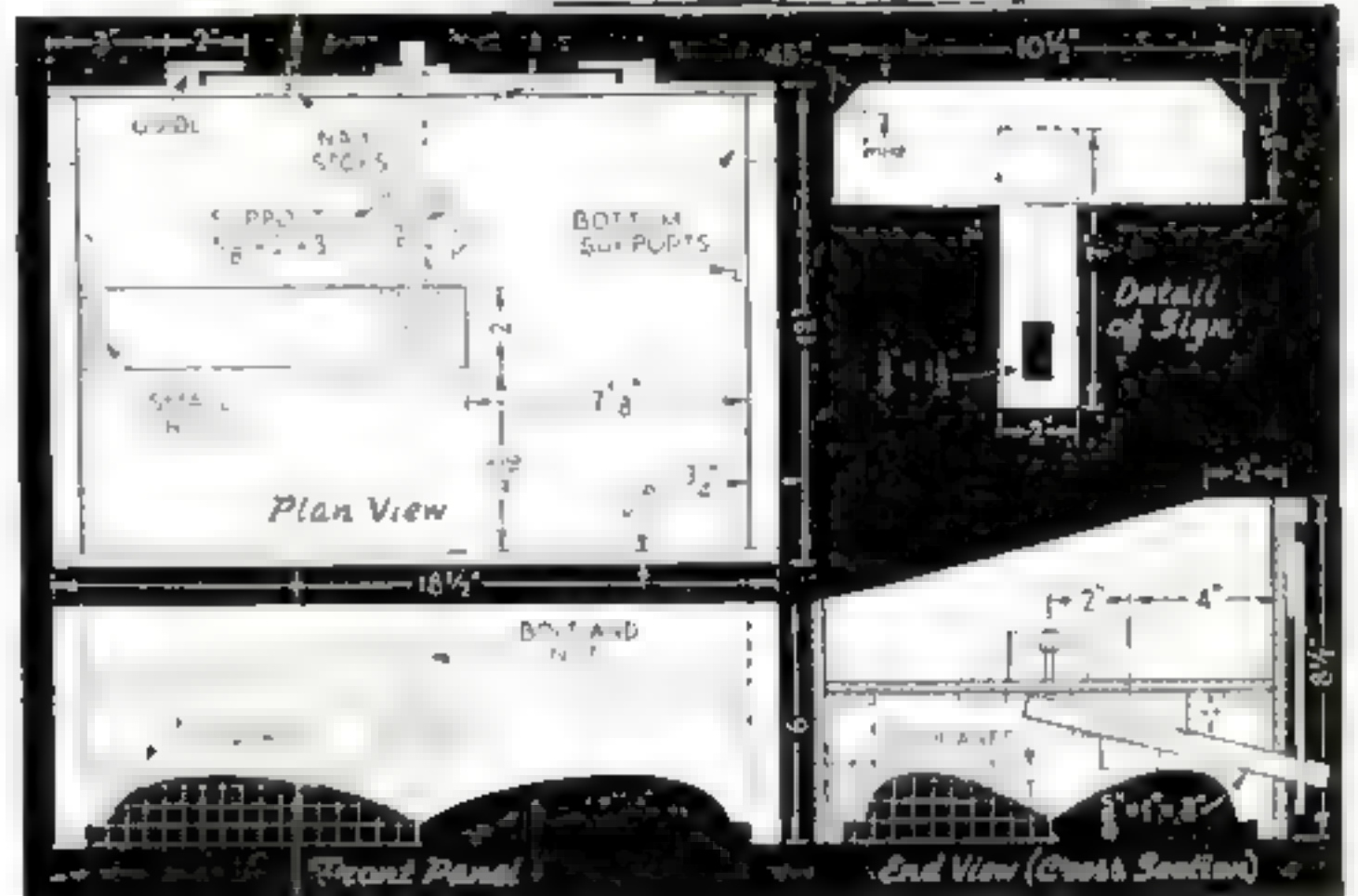


THIS bed for a small house dog never fails to cause amusement because as soon as the dog gets into it, a sign bobs up with the legend "DO NOT DISTURB."

A shipping box of the right size was obtained, the bottom was raised 4 1/4 in., the ends and front cut down, and the scroll design sawed on the sides and ends. The sign and moving parts were then attached as shown in the mechanical drawings and adjusted to operate smoothly by pressing down the hinged piece in the box.

When completed, the bed was sanded

smooth and given a coat of flat paint followed by one of white enamel. The corners were painted black to help hide the nail holes.—GEORGE MILLER.



How the dog bed is assembled and a detail of the sliding sign

## How to Start a Screw in an Awkward Place



A screw held on the driver blade by narrowing the slot slightly

A SCREW can be held firmly on a screw driver for starting it in a tight place by the simple expedient of closing the slot sufficiently to make the screw-driver blade a light drive fit. This is done by placing the screw loosely in the vise, head up, and tapping the head until it will stick on the blade.—G. F. LAMPKIN.



# An Easy Way to Turn

**M**ANY small parts required in model making can be shaped on the lathe, but when ordinary methods of chucking and turning are employed, the work calls for considerable skill on the part of the craftsman. The method illustrated is a new and easier way to make turnings from hardwood dowels while they are held in special chucks. As the dowels are always perfectly centered and have no rough corners to be removed, this system not only reduces breakage, but also enables the worker to make ship-model masts and yards—something that is hardly possible on the lathe by any other method.

Two different chucks are required, one for the headstock and the other for the tailstock. The one for the headstock is constructed first. A piece of wood about 1 3/4 in. thick is fastened to the faceplate and turned to a diameter of 3 1/4 in. The face of the block is trued, and a turning tool is used to bore a hole in its center. The depth of this hole should be the same as the length of the threads on the lathe spindle and its diameter slightly less than that of the threads.

The turning is removed from the lathe, the faceplate being left upon the

block. After the threads of the spindle are started into the hole in the block, the tailstock is placed so that its sleeve fits into the spindle-thread hole in the faceplate. As the block is screwed onto the spindle, the tailstock sleeve is advanced, thus insuring a perfectly centered turning.

Now the metal faceplate may be removed, and the face of the block turned true. A recess 2 1/2 in. in diameter and 1/2 in. in depth is turned in this face. A 5/16-in. hole is then bored the rest of the way through the block. A number of disks 1 3/8 in. thick are turned to suit

this recess. Each of these is fitted into the faceplate block, and a groove is turned in the circumference where the insert emerges from the block. Three small screws are inserted into the faceplate block with washers that fit into the groove in the insert. If one side of the washers is filed flat, the screws need only be loosened and the washers turned to permit the insert to be removed.

Each of the inserts is drilled for a different size dowel. The sizes most commonly used are 1/8, 1/4, 5/16, 3/8, and 1/2 in. A clamp-screw hole is

Shaping a model belaying pin from a hardwood dowel with a tool made from a small file. Two special wooden chucks are used at headstock and tailstock to hold the dowel firmly and center it with precision.

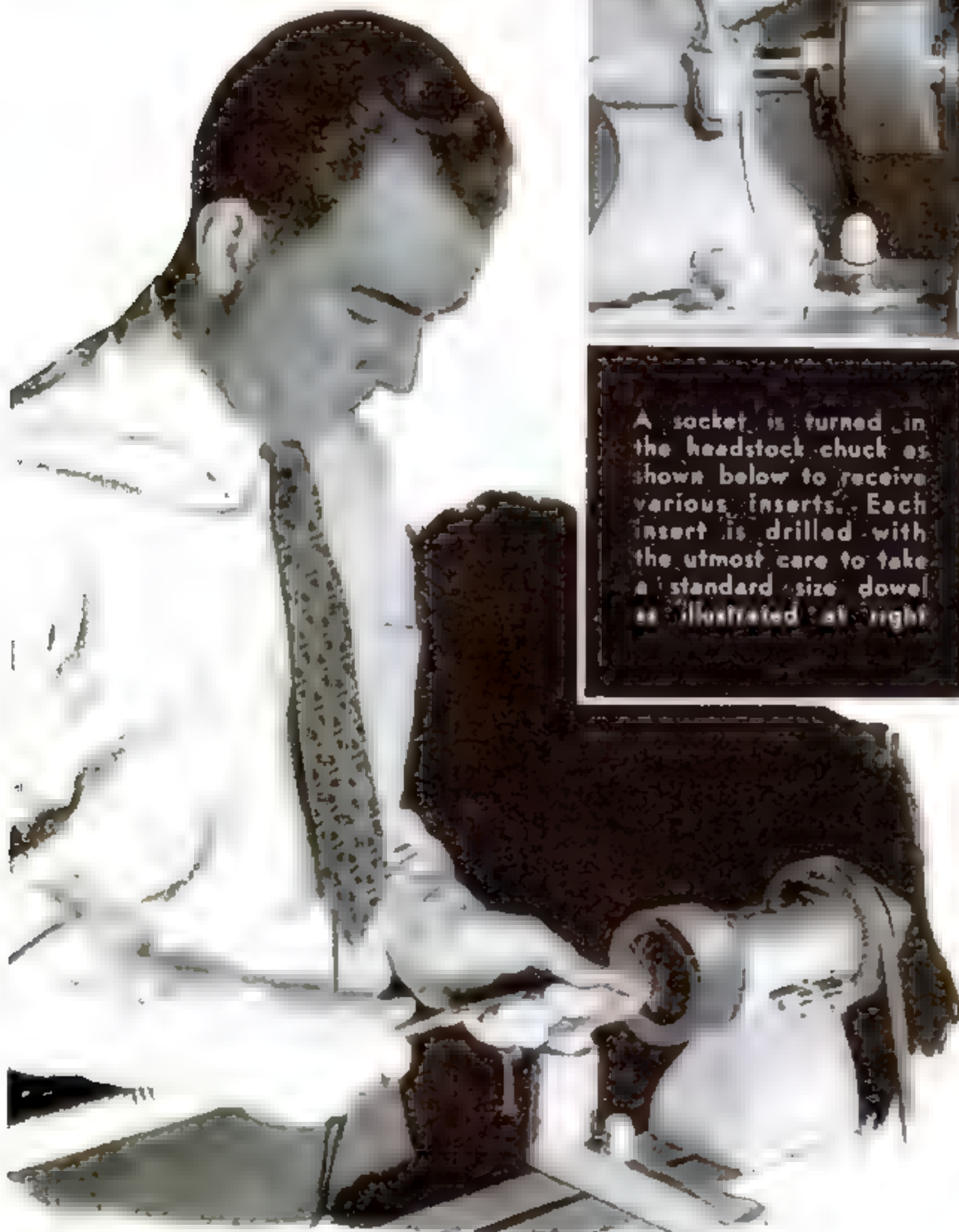


At left, how the headstock chuck is screwed onto the lathe spindle. The tailstock sleeve is set into the spindle-thread hole of the attached faceplate to insure accurate alignment.

A socket is turned in the headstock chuck as shown below to receive various inserts. Each insert is drilled with the utmost care to take a standard size dowel as illustrated at right.



**How to Make Masts, Yards, Guns, Deadeyes, Stanchions, Belaying Pins, and Similar Small Fittings from Common Hardwood Dowels or Rods of Type Metal or Other Alloys**





# Model Parts

By HOWARD R. HEYDORF

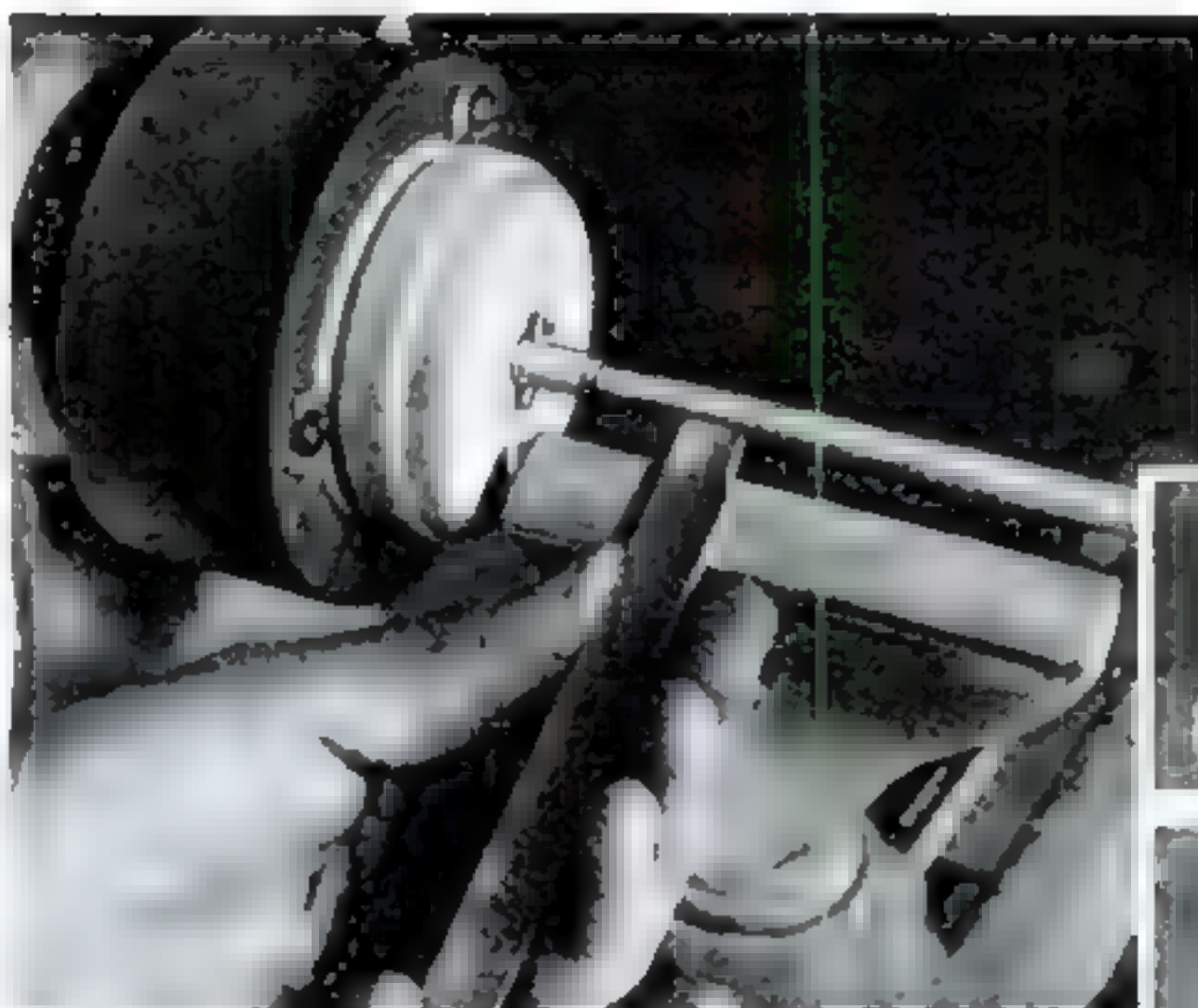
drilled in each insert, and the screw made from a 3/16-in. bolt with a wing nut and an ordinary nut locked together to permit tightening. It may be necessary to use another screw on the opposite side to prevent the dowel from being forced out of line.

The chuck for the tailstock is turned between centers to the shape shown. The measurements for the taper shank may be taken from the regular dead center. To permit accurate fitting of the turned shank, it is lined lengthwise with black crayon and inserted into the socket in the tailstock. As it is revolved, the high places are plainly marked with black rings. These are then sanded. The chuck is next fitted into the headstock spindle and drilled for the dowel.

If desired, instead of making a chuck for each size dowel, a number of turnings may be made with the correct size hole in one end and a shank to fit the tailstock chuck on the other end. A small metal pin may be inserted between the parts to prevent their revolving.

Straight, uniform dowels of the desired size should be selected for turning. One end is fastened in the headstock chuck, and the other end slipped into the tailstock chuck. When possible, this end should be lubricated with wax or oil. It is best with these small turnings to have no more of the dowel exposed between the chucks than necessary.

On repetition work a long length of dowel may be used by extending the extra part through the spindle. As it is used up, a new length may be pulled through the chuck, thus eliminating chucking waste. Fine tools for this small work can be made from discarded three-corner files of a length from 6 to 8 in. These are honed and used in the *(Continued on page 91)*



In tapering such parts as the yards for a ship model, coarse sandpaper is used with a backing block to take the side pressure as shown below

Turning down the end of a ship-model yard. To drive the dowel, a wire is set through it so as to bear against a tack driven into the chuck

Right, how a sandpaper strip is used to finish the yard. This method avoids subjecting the work to any side strain



Three flat-sided washers enable the inserts to be changed quickly



To avoid having to make a separate tailstock chuck for each size dowel, one chuck is used with several different adapters or cups

The shank of the tailstock chuck is lined with black crayon to aid in tapering it so that it will fit the tailstock sleeve perfectly



The necessary dowel stock for the tailstock chuck may be prepared by casting an alloy of low-melting point in paper tubes



# These Four Clubs

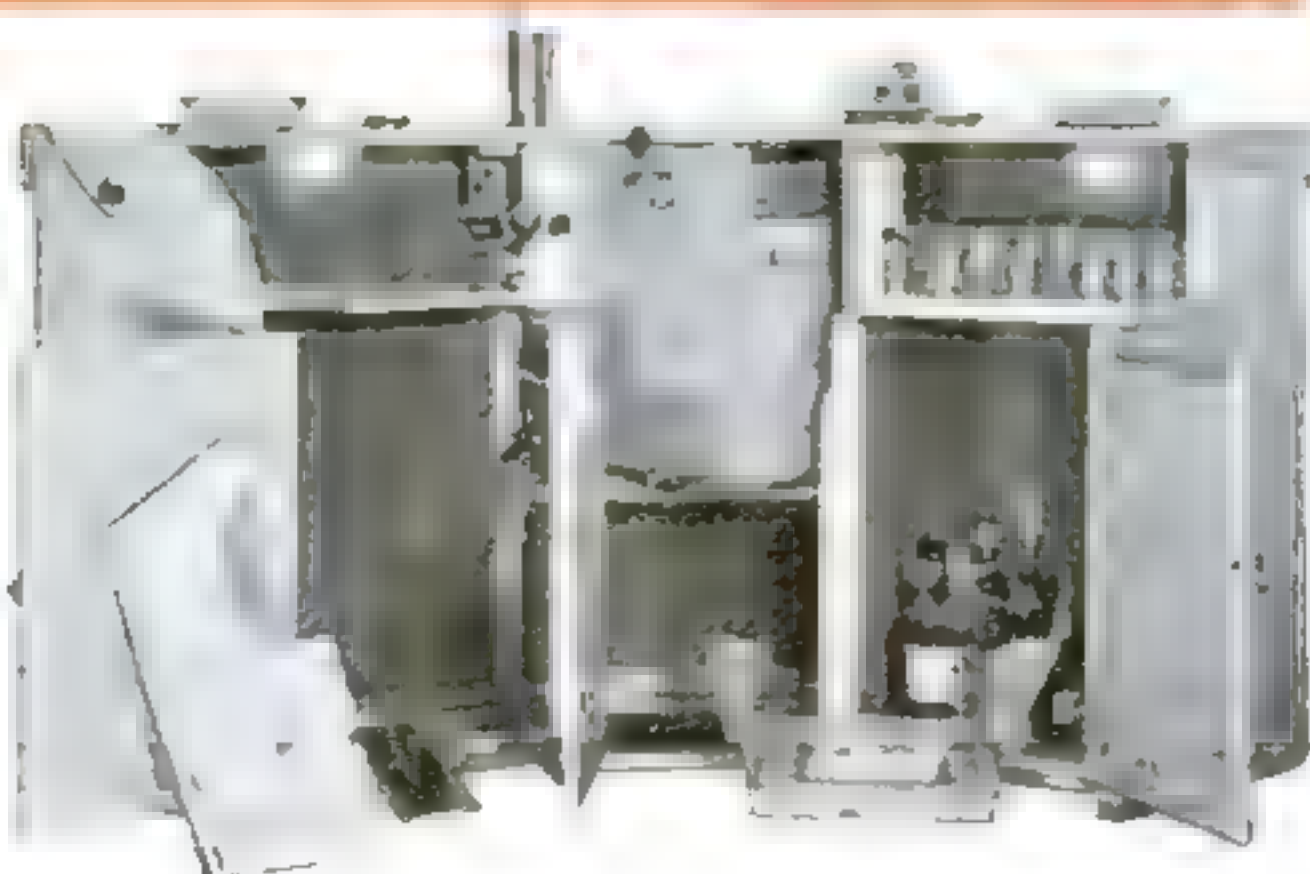
NATIONAL PRIZE WINNERS SELECTED IN THE



John Nichols, chairman of the Guild's board of trustees presents the craftwork plaque to Harold Post, president of the Wood-Ridge (N.J.) Homeworkshop Club. At right is William Aitken, treasurer



Refreshment bar in the form of a huge drum made by Mr. Post, one of two projects submitted by the Wood-Ridge club. At right is a view of the rear with all the compartments open



FOR outstanding achievements in civic activities, craftwork, club programs, and radio broadcasting, **POPULAR SCIENCE MONTHLY** is awarding silver plaques to four clubs in the National Homeworkshop Guild. These clubs, selected from among more than 260 clubs by a great national contest (see P.S.M., Nov. '37, p. 101), are listed above. Their victory entitles them to first place on the honor roll of the Guild.

Reports of what all the competing clubs accomplished in the six-months period (October 1, 1937, to April 1, 1938) brought expressions of amazement from the judges. No better evidence of the value of the home workshop hobby could be given, they declared.

Members of the Jacksonville (Fla.) Homeworkshop Club won the civic activities award through a highly commendable philanthropy. They built 147 novelties, toys, and odd pieces of furniture, all of which they put up at public auction. More than 300 persons, who had seen the articles displayed in a hardware store window, crowded into the meeting room to make their bids. The sale netted \$222. With the money the club purchased 159 pairs of shoes, 115 wool sweaters, 48 pairs of socks, and 47 pair of pants. These were distributed through Parent-Teacher Associations to needy children in twelve local schools.

In the craftwork division the Wood-Ridge (N.J.) Homeworkshop Club submitted descrip-



# Lead the Guild

## 1938 HOME WORKSHOP ACHIEVEMENT CONTEST

tions of two projects although only one entry was required. The projects were a set of six walnut dining-room chairs made by George N. Schalk and a refreshment bar built in the form of a huge drum by Harold W. Post. These easily surpassed the other entries in the craftwork division, and either one would have entitled the club to the prize, so the judges awarded the craftwork plaque to Wood-Ridge and engraved sterling silver medals to the two men.

Beautifully presented in a scrapbook with walnut veneer covers and a red plastic binding, the report of the Independence (Mo.) Homeworkshop Club immediately caught the eye of the judges. As they turned the large pages (each measured about 13 by 16 in.), they marveled at the variety of

excellent programs given during the six months. The club began its season with a demonstration of how to use a spindle shaper. This was followed at subsequent meetings with demonstrations and talks on wood carving, metal turning, foundry practice, etching and engraving, metal spinning, wood turning, model railroading, and lacquer finishing. The

members also visited an archery-equipment concern and a cabinet shop, and saw a talking moving picture at a dinner meeting. The plaque for the best club programs therefore goes to Independence.

Transcriptions of five radio programs won a special award for the Lexington (Ky.) Homecrafters. Members gave talks over Station WHAS of Louisville. The entry was submitted in the civic activities division, but the judges decided it merited an extra plaque. Only three awards—for civic activities, craftwork, and club programs—were originally announced.

George Schalk receives his craftwork medal from Mr. Nichols. At right, one of the six chairs he built



Left, winning entry in the program division. The covers are of walnut veneer

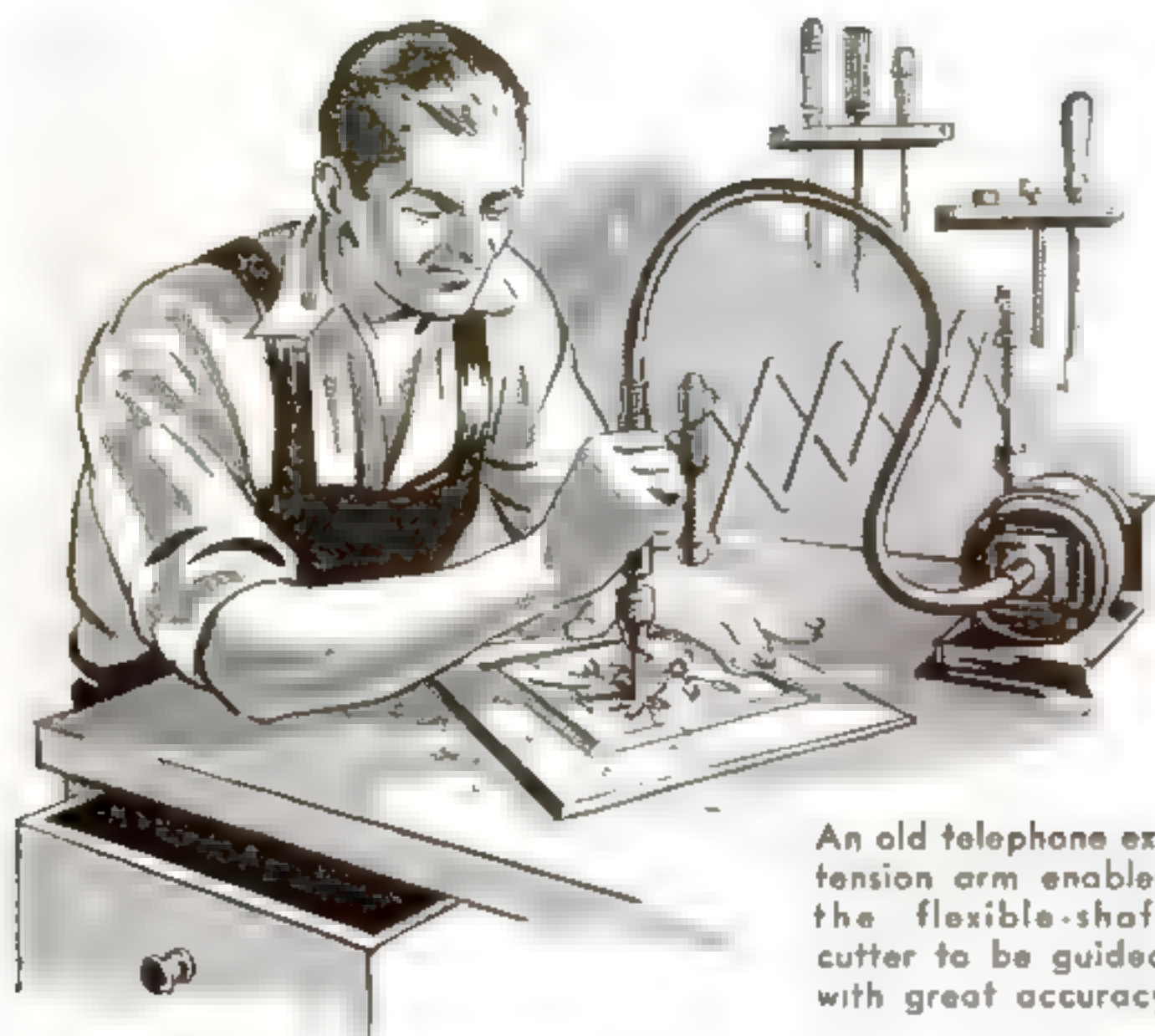


This stack of shoes, sweaters, socks, and pants was purchased with money raised at a public auction of articles made by the Jacksonville (Fla.) Homeworkshop Club. The clothing was distributed through P.T.A. groups to needy school children



# Lazy Tongs Guide Cutter

## FOR ROUTING AND CARVING



An old telephone extension arm enables the flexible-shaft cutter to be guided with great accuracy

company shop. Somewhat similar lazy tongs, made as luggage carriers, can also often be obtained from auto repair shops or junk yards.

It so happened that the semicircular bracket on the end of the arm conformed exactly to the head of my flexible shaft, so I merely hold the two together as shown. The cutter may be raised and lowered during the routing operation by loosening the grip enough to enable the head to be moved up or down. I find it easier to guide the cutter over the work in this way than

FOR routing and wood carving, I support the cutting head of a flexible shaft by means of a junked telephone extension arm or lazy tongs as illustrated. The arm was obtained for a few cents from a local telephone

to move the work about on the table of a drill press. The cutter can easily be swung to reach any part of work as large as 3 or 4 ft. square, and the depth can be regulated with one hand without stopping.—A. H. WAYCHOFF.



### Dog Opens Screen Door with Nose

MANY steps have been saved in our home by the simple screen-door opener illustrated. This enables our bull terrier to open the door from the outside by pushing his nose behind the metal plate. The dog enjoys this because the door had baffled him for months. He quickly got the idea after two or three trials when one person held him with his nose behind the plate, while another called him from inside.



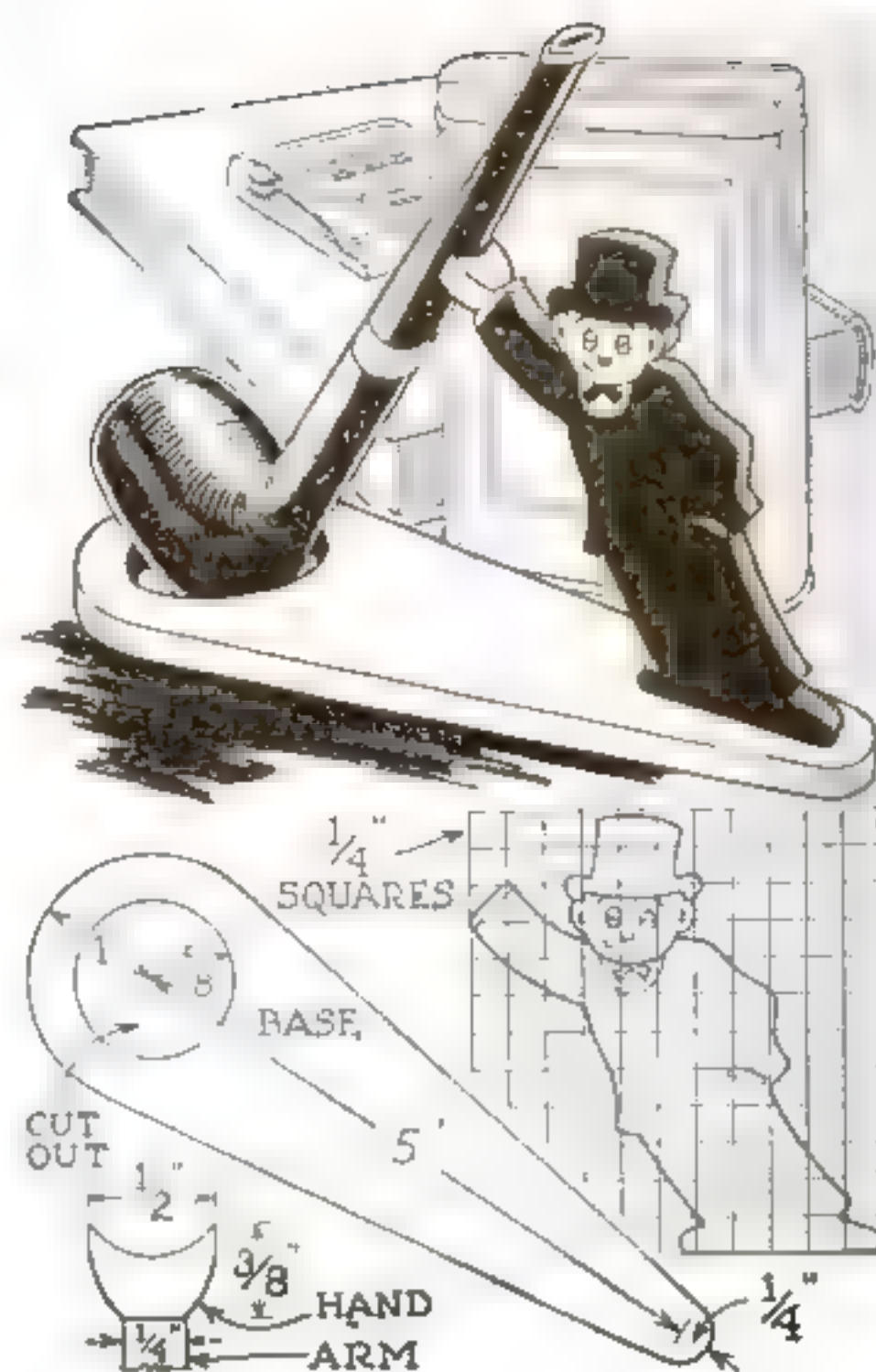
To open the door from the outside, the dog pushes his nose behind the brass plate, which projects at an angle

The attachment is  $\frac{3}{8}$ -in. brass, 5 by 8 in., decorated with an aluminum bull terrier cut from  $\frac{1}{16}$ -in. stock. It is screwed firmly to the edge of the door as the normal height of the dog's nose. The plate is bent to project outward at an angle of about 30 deg., and the outer corners are rounded.—C. W. HOUGH.

### Giving Printed Game Cards a Durable Finish



SOME games require the use of printed cards, which become soiled and dog-eared with continued use. To prevent this, it pays to coat the cards when new with clear lacquer or spar varnish. A drying board should be prepared by driving pins into a board and cutting off the heads. Arrange the pins so that three will support each card. Then use tweezers to hold the cards while immersing them for a few seconds in lacquer or varnish. Let them drain and lay them on the pins to dry.

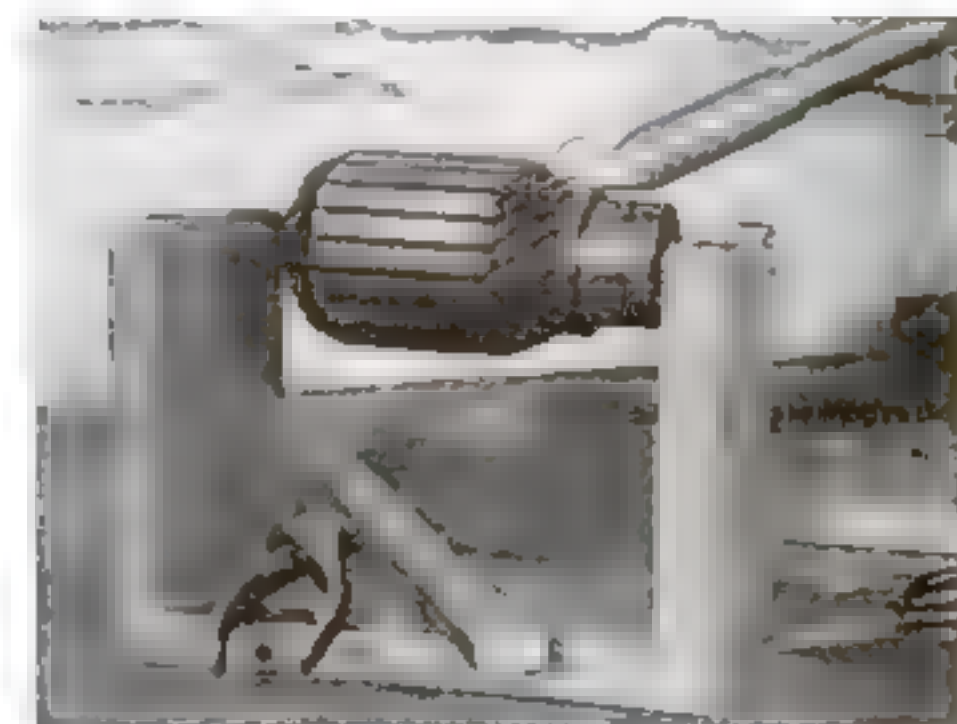


### Comical Pipe Rest Cut from Thin Wood

THIS amusing pipe rest can be jigsawed in double-quick time from scrap material. Cut the figure, base, and hand from  $\frac{1}{4}$ -in. thick wood, sand them thoroughly, and assemble with glue and brads. Apply a coat of flat paint or prepared enamel undercoat, and follow with two coats of enamel in the desired colors. The original "Tipsy Tim" figure was dressed in black shoes, suit, hat, and tie, and was mounted on a rich orange-colored base. Glue a piece of felt underneath the base.—C. L. S.

### Heat-Resisting Solder for Commutator Work

THE armature of a heavily loaded motor or a generator which has been boosted to a very high output may heat to such a degree that the solder in the riser slots melts and permits some of the leads to be thrown out of place. A recurrence can generally be prevented by using solder of a higher melting point, such as one containing two or even three parts of lead to one of tin. This solder is of somewhat inferior conductivity, but the loss is negligible in this case.—W. C. W.



A solder of three parts lead to one of tin repairs an armature that tends to run hot



# WEIRD DANCING



Two fine examples of Javanese rod puppets with faces carved to represent ceremonial masks

## Operated by Rods Instead of Strings

By

LESLIE P. GUEST

AVANESE rod puppets are simple in construction, easy to manipulate, and quite different from the modern types of hand puppets and string marionettes sly described in POPULAR SCIENCE MONTHLY\*.

The two puppets illustrated above are genuine Javanese, obtained on a world cruise by Mrs. Irene Mulholland, mother of John Mulholland, the magician. They are above the average of Javanese native arts, and the heads are exquisite bits of wood carving.

Javanese rod puppets are displayed by native showmen known as "Dulang," whose plays are all based on ancient religious dramas and rites, the cycle being called "Wayang Golek." Although the puppets are limited in action, their articulation is such that they can reproduce the weird, intricate motions of the Javanese ceremonial dances. The faces are not true features, but rather ceremonial masks, while each bit of carving in the ornate headdress has some special significance.

Any reader can make similar puppets for his own amusement from odd bits of wood with little more than a pocketknife for a tool. The Javanese style may be followed, or the same construction may be used with heads of a more familiar kind.

The torso is carved in one piece as shown, nicely rounded and smoothed off, then drilled to take the center rod loosely. Between the shoulders, a larger hole is bored or cut into which the neck will fit and revolve freely.

The upper and lower arms are carved without respect to anatomy or detail. They are quite loosely jointed at the elbows and shoulders with string. The hands are abstract, but if the proper angle to the wrist is observed, they are most expressive when in motion. The rods for manipulating are 14

in. long and loosely joined to the hands with string. In the original Javanese, these rods are thin bamboo, but thin wires or pieces of umbrella ribs would be less conspicuous.

The head is carved from one piece of wood, and the extreme arch of the neck gives the figure poise and personality. The neck is drilled a snug fit for the center rod.

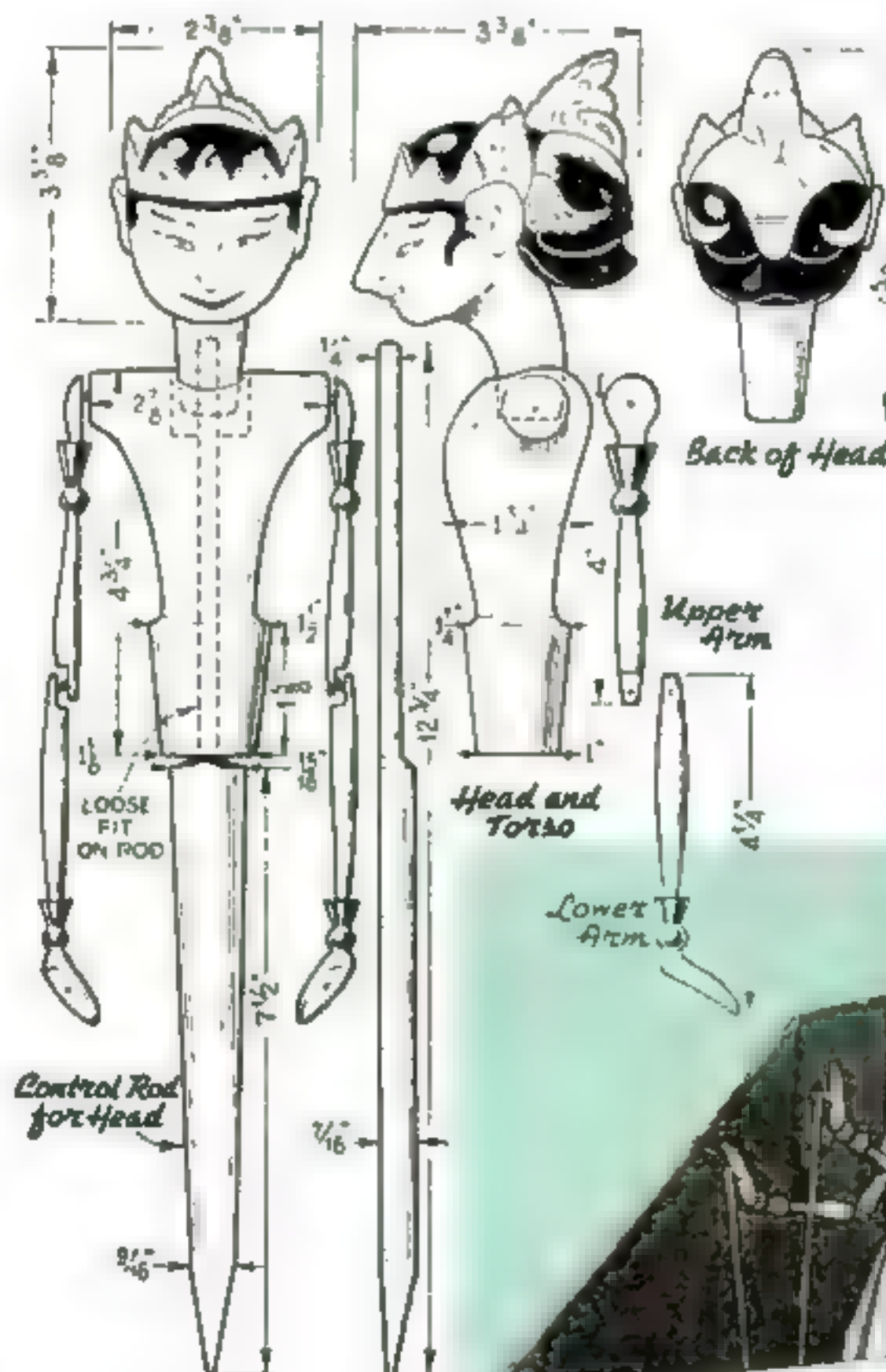
Coloring is a matter of personal taste. In the examples illustrated, the neck, torso, and arms are gilded, and the projections at elbows and wrists enameled red. The face is chalk-

white, with black hair and eyes, and red lips. The headdress includes a gilded crown lined with red. Top and back parts are shiny black, while the decorations are red, gold, and two shades of green. Glass-bead pendants ending in fuzzy red pompons hang from the front of the ears.

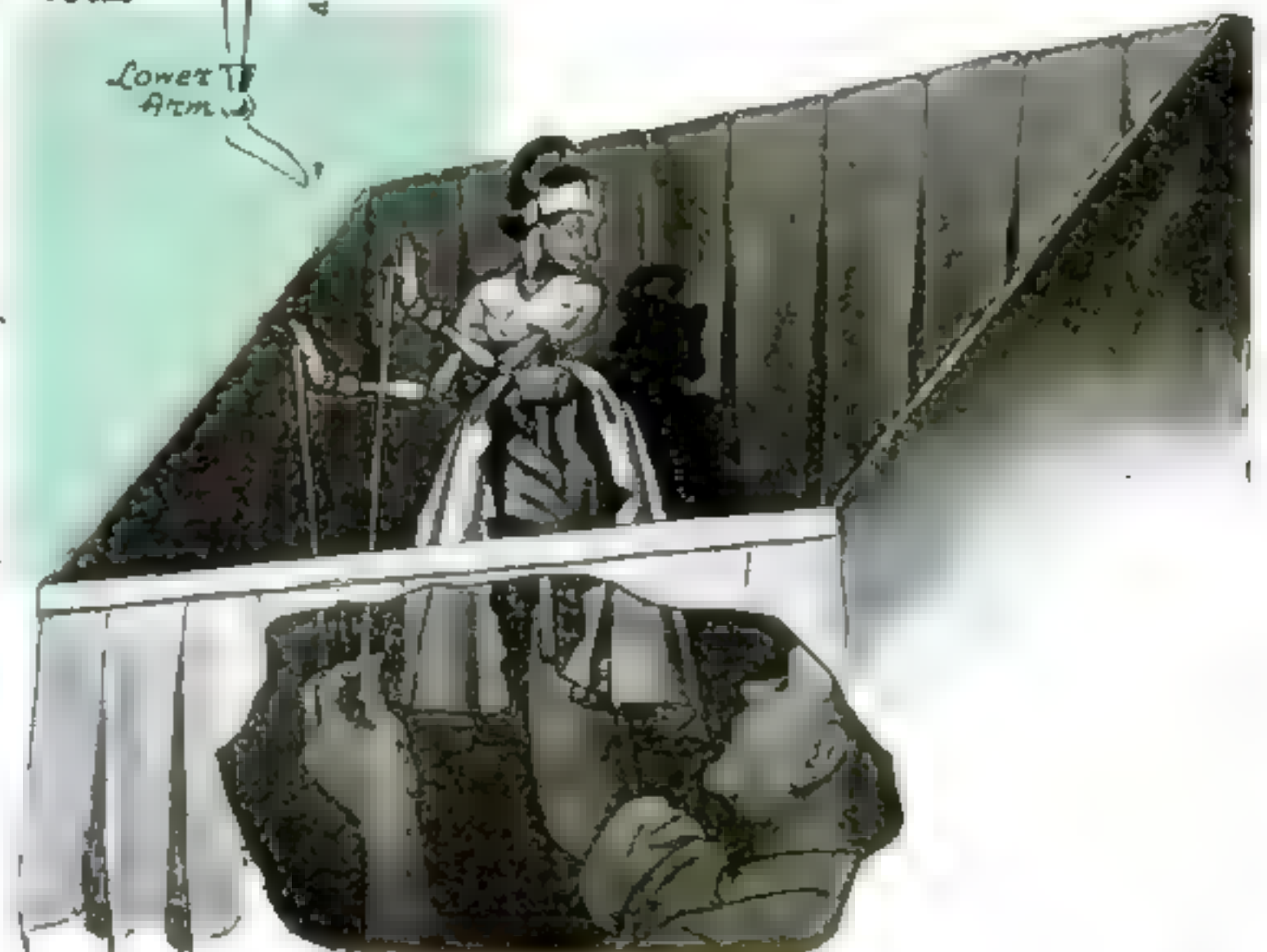
The figures are costumed in hand-made batik, the pattern a reddish brown. The skirt is rolled and sewed above the ledge of the waist, thus giving some fullness to the figure below the hips. The skirt should extend about 3 in. down beyond the end of the rod.

To operate, hold the center rod with one hand inside the skirt. The other hand holds the two arm rods, and with a little practice, these may be manipulated separately or in unison. This same hand can twist the shoulders, while a quick twist on the center rod will move the head from side to side. If you raise your hand until you can reach the base of the torso and push this up and down on the center rod, the puppet will appear to duck her head.

To complete the illusion, operate your puppets from behind a screen, the upper edge forming the stage. These figures can also be used to advantage in a Punch-and-Judy or hand-puppet stage.



How the parts of a rod puppet are cut out and assembled. At right, a broken-away view to show method of manipulation

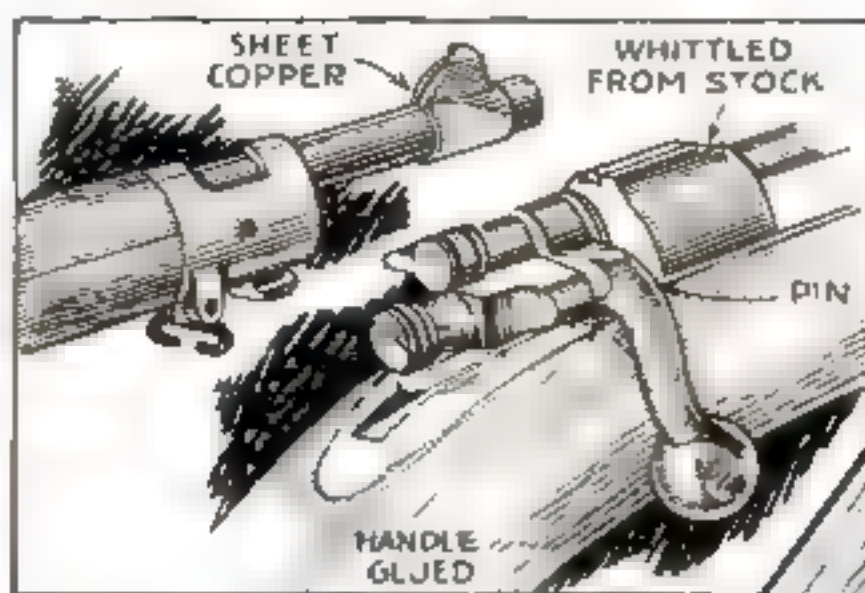


\*For detailed instructions in regard to conventional marionettes, hand puppets, stages, scenery, and lighting effects, refer to "How to Make Your Own Marionettes" (Popular Science Publishing Co., Inc., New York, price 50 cents).



# Springfield Rifle

## IN MINIATURE



Sketches of the bolt mechanism, front sight, and upper band group

EVERY man who has served in the United States Army, the National Guard, or almost any military organization in this country is familiar with the appearance, weight, and other characteristics of that famous weapon, the Springfield rifle, otherwise known as the United States rifle, caliber .30, model of 1903. It is therefore one of the best possible subjects for the many amateur craftsmen who are taking up the fascinating hobby of making model firearms.

The accompanying drawings are the actual size of a scale model that is one quarter the size of the real rifle. The original model is made entirely of wood except the barrel, the leather sling, and the parts otherwise marked. The barrel is a 16-penny nail with a small hole drilled in the end.

The bolt is carved separately and glued and nailed on. There is a nail through the bolt handle to help strengthen it, as

By  
**CHARLES HOZIER**

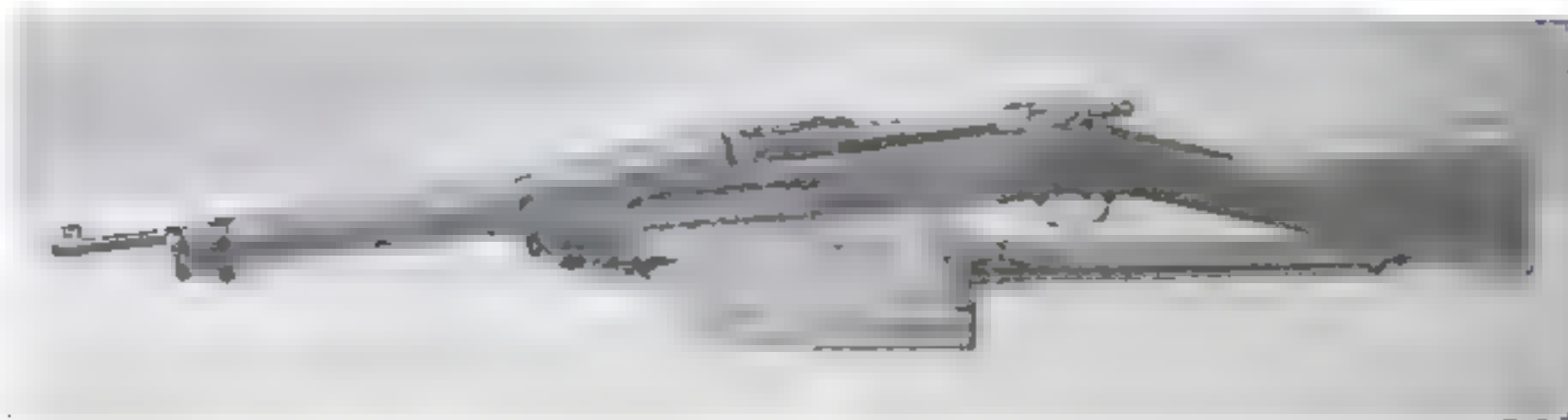
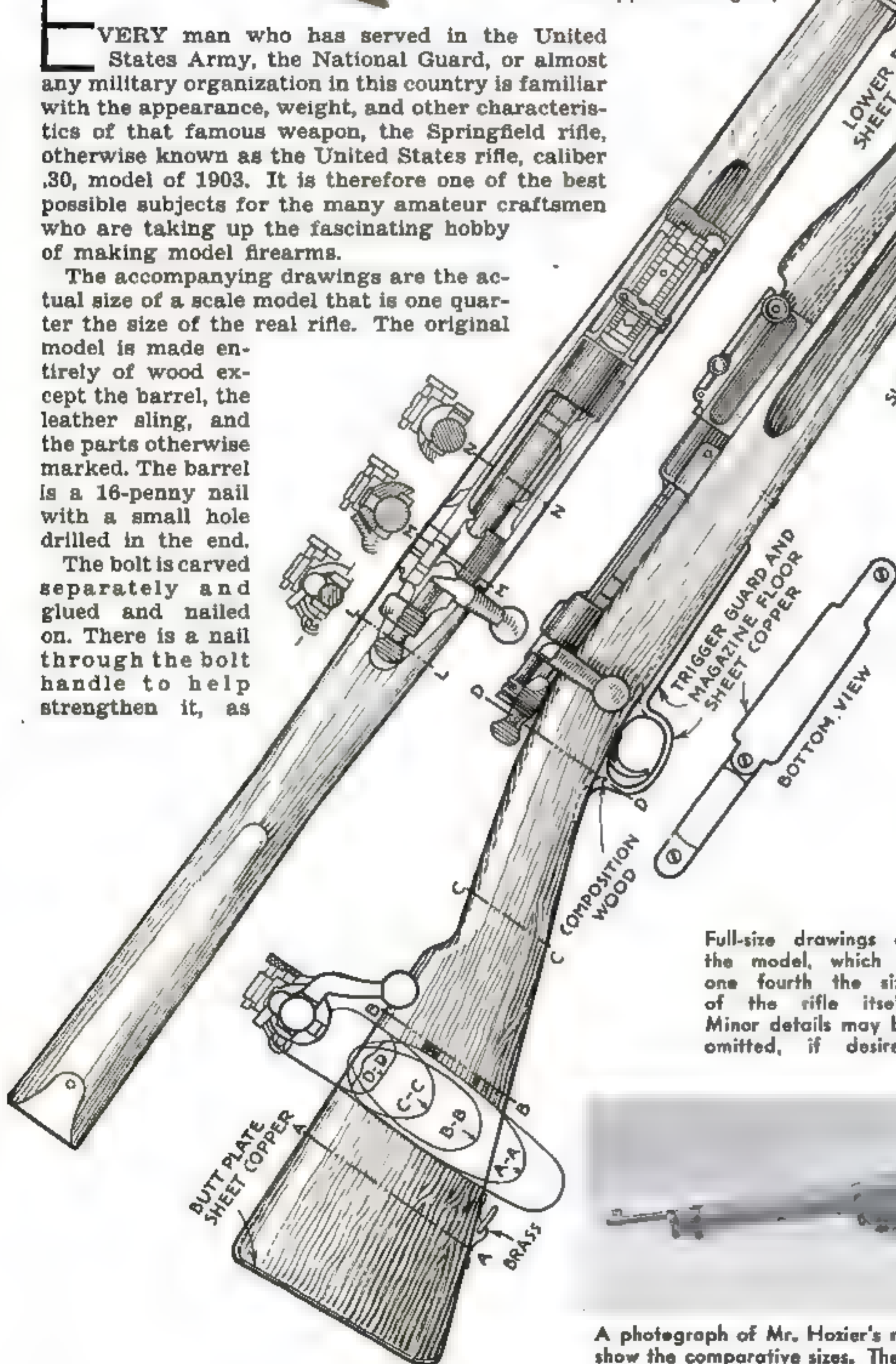
everyone who picks up the model is certain to finger the bolt. The sight-leaf slide binding screw and the windage screw on the rear sight are both cut from hardwood and glued into holes drilled in the whittled sight. The sight itself is all part of the wood from which the stock is made.

More details are indicated on the drawings than the average model maker is likely to wish to include on so small a model, but it is easy to simplify the parts to any degree desired. A visit to a local armory to examine one of the rifles will be found helpful.

The lower sling swivel is of  $\frac{1}{8}$ -in. brass, fastened in a recess in the stock with two screws. In the sling itself I punched only the holes necessary to keep it in place.

It is best to make the stock and wooden parts of walnut. After sanding the stock to a perfect finish, dampen it to raise the grain, let it dry, and sandpaper it again very lightly with fine paper to remove the raised fibers. Warm the wood slightly, brush on warm raw linseed oil, and let it stand for twenty-four hours. Apply walnut-colored paste wood filler and rub off in the usual way. Let dry overnight and sandpaper lightly. Now mix boiled linseed oil and genuine turpentine in equal parts and brush on a coat. Repeat this once a day until the surface becomes somewhat gummy, indicating that the wood is well filled with oil. Then rub with felt until a beautiful, dull polish is obtained. A little fuller's earth or rottenstone may be used in polishing. *(Continued on page 87)*

Full-size drawings of the model, which is one fourth the size of the rifle itself. Minor details may be omitted, if desired



A photograph of Mr. Hozier's model with a clip of real cartridges lying in front to show the comparative sizes. The stock is walnut; the barrel, a common 16-penny nail



# FITTING Metal Hubs TO Wooden Pulleys



The hub, which is one half of a flexible shaft coupling, is centered on the turned pulley with the aid of a dowel

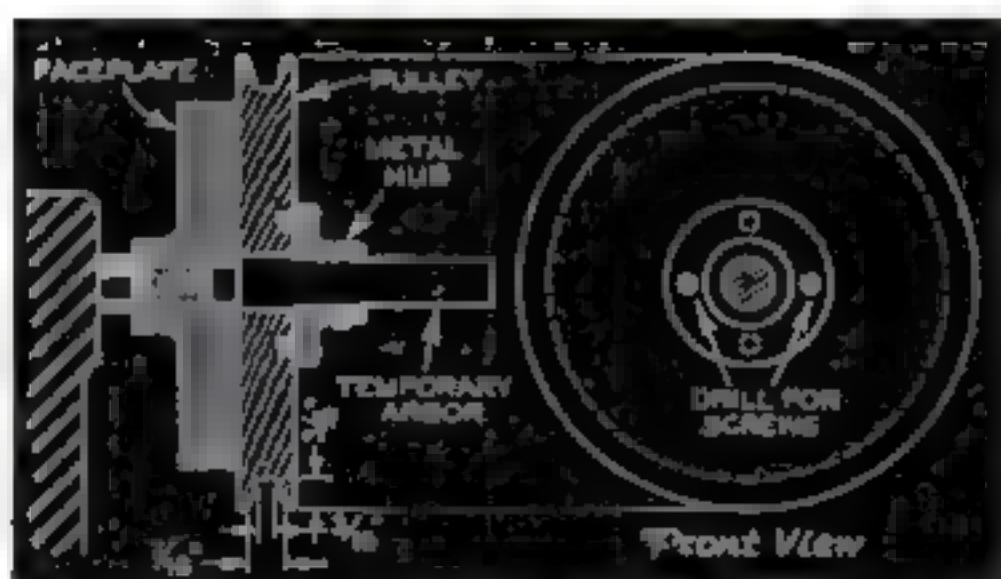
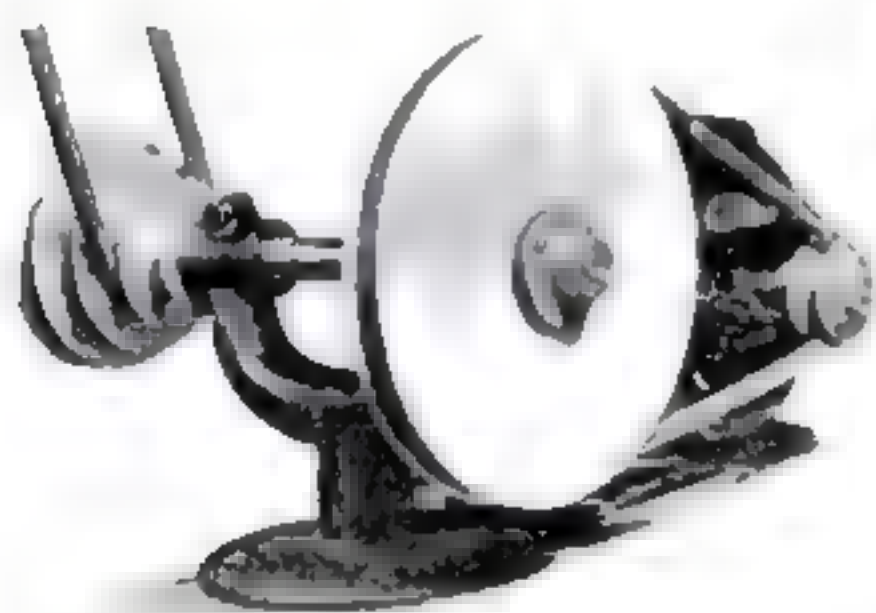
turn the surface true. Reverse the disk, turn the other surface, and turn the edge to suit the belt to be used. Bore a hole from  $1/64$  to  $1/32$  in. larger than the shaft, and taper the end of a 3-in. long wooden dowel rod to fit the hole snugly. Force the dowel in place and turn the exposed portion to the exact diameter of the shaft. Slip a hub over this, mark the positions of the two projections, and drill

the pulley to receive these projections. These holes should be of a size to fit the projections approximately. Then drill two holes through the flange of the hub at approximately 90 deg. from the projections, and attach the hub with heavy wood screws.

Remove the pulley, detach the hub, remove the wooden arbor, and replace the hub. Then place the pulley on a short length of shafting, tighten the set screw, and mount a second metal hub on the other side of the disk in the manner just described.—AMOS SCOTT.

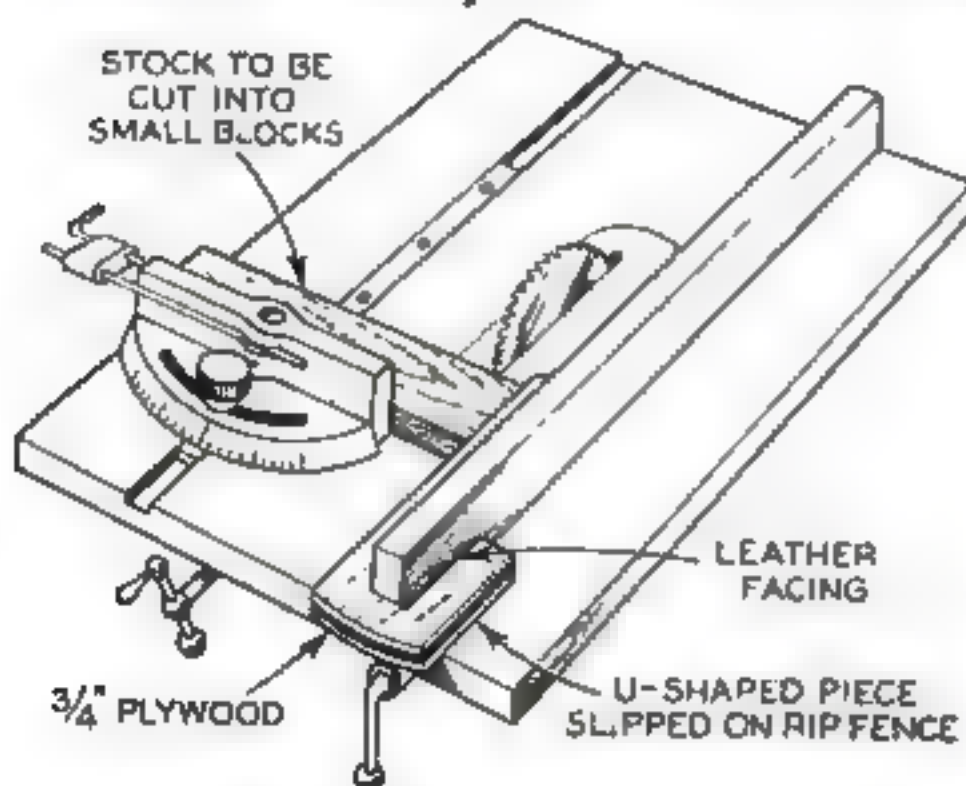
WOODEN pulleys are easy to make, economical, and generally useful, but it is difficult to fasten them properly to the shafting. If metal hubs are applied, this drawback may be overcome and the construction much simplified. Fortunately, hubs can be made from the small flexible couplings used to connect shafting end to end. These are available at small cost in many sizes, and each consists of a rubber disk and two castings. The latter are used for hubs.

Cut a disk of wood slightly larger than the diameter of the finished pulley, mount it on the lathe faceplate, and



Pulley for  $3/8$  to  $1/2$ -in. V-belt. Left, as used on low-speed jack shaft made from grinder stand

## Safe Way to Cut Small Blocks on a Saw



This simply made addition to the rip fence makes it impossible for the blocks to jam

IF A NUMBER of small blocks have to be cut off on a circular saw, it pays to make a U-shaped piece to slip on the rip fence as shown. This will keep the blocks from jamming between saw and rip fence and perhaps flying back to hit the operator. The extra piece is best cut from  $3/4$ -in. plywood to avoid splitting. It should be about  $1\frac{1}{4}$  in. wide if for a small saw, with the cut-out made slightly wedge shaped so the piece will not be loosened by vibration. The face of the shorter leg should be covered with leather.—B. P. SEWARD.



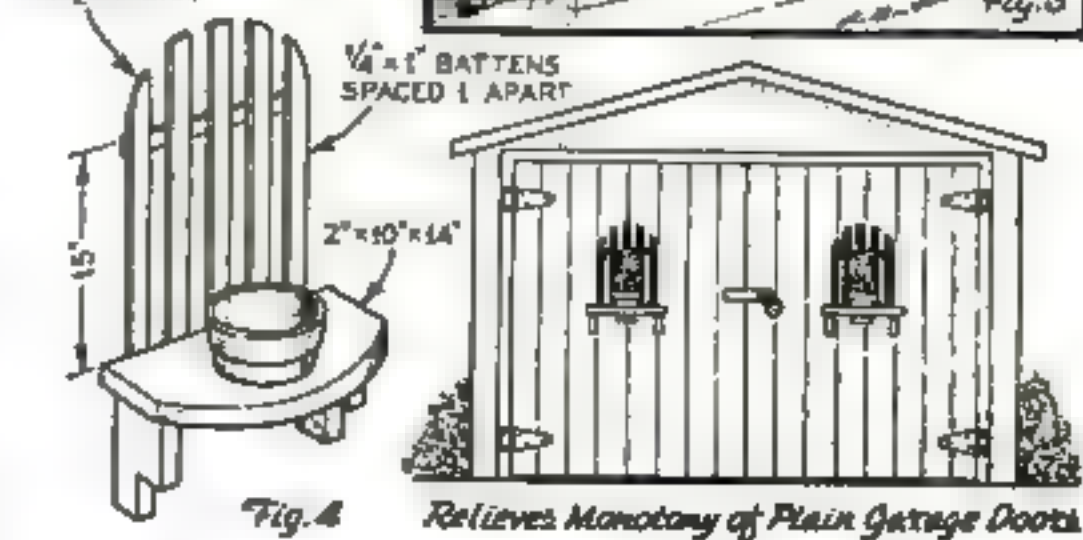
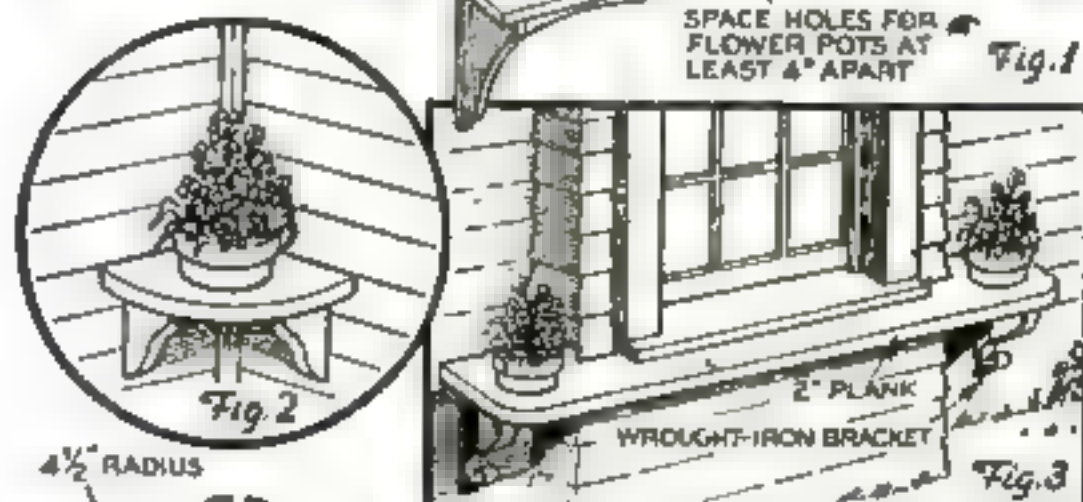
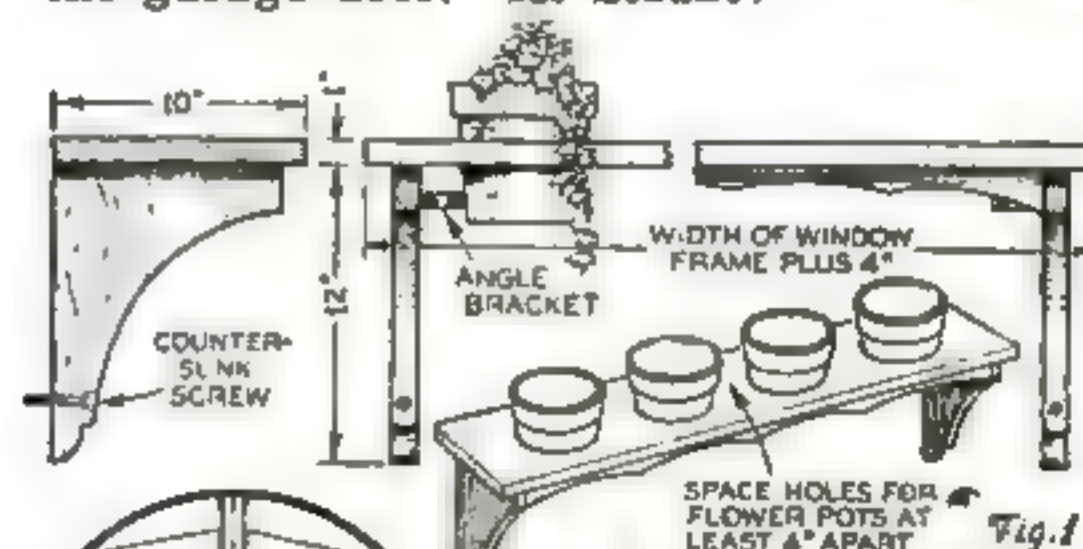
## Flowerpot Brackets Add Color to Bare Walls

MODERN flowerpot brackets have two advantages over window boxes: they are more pleasing to the eye, and removing the plants for cold weather is a simpler procedure.

Four designs are illustrated, all of them very easy to build. In Fig. 1 below and also illustrated above is a design that harmonizes well with a wooden structure, but if painted, it is also adaptable to stucco or brick.

The simple corner bracket shown in Fig. 2 is effective where windows are so placed as to leave considerable blank wall area at the corner. Shallow bay windows are improved in appearance by the shelf arrangement in Fig. 3.

Garage doors as a rule are designed for utility only, but the plainest of them can be made attractive with twin brackets, as shown in Fig. 4. The brackets should be painted a bright color, such as orange, apple green, or Chinese red, to contrast with the garage door.—HI SIBLEY.



A wide window bracket, a small corner bracket, a design for bay windows, and garage-door brackets



# LONG-HANDLED SCRAPER Cleans Eaves Troughs FROM THE GROUND



Scraping leaves and sediment from a gutter. Right, details of the two different types of tools used

By  
J. D. GARFIELD

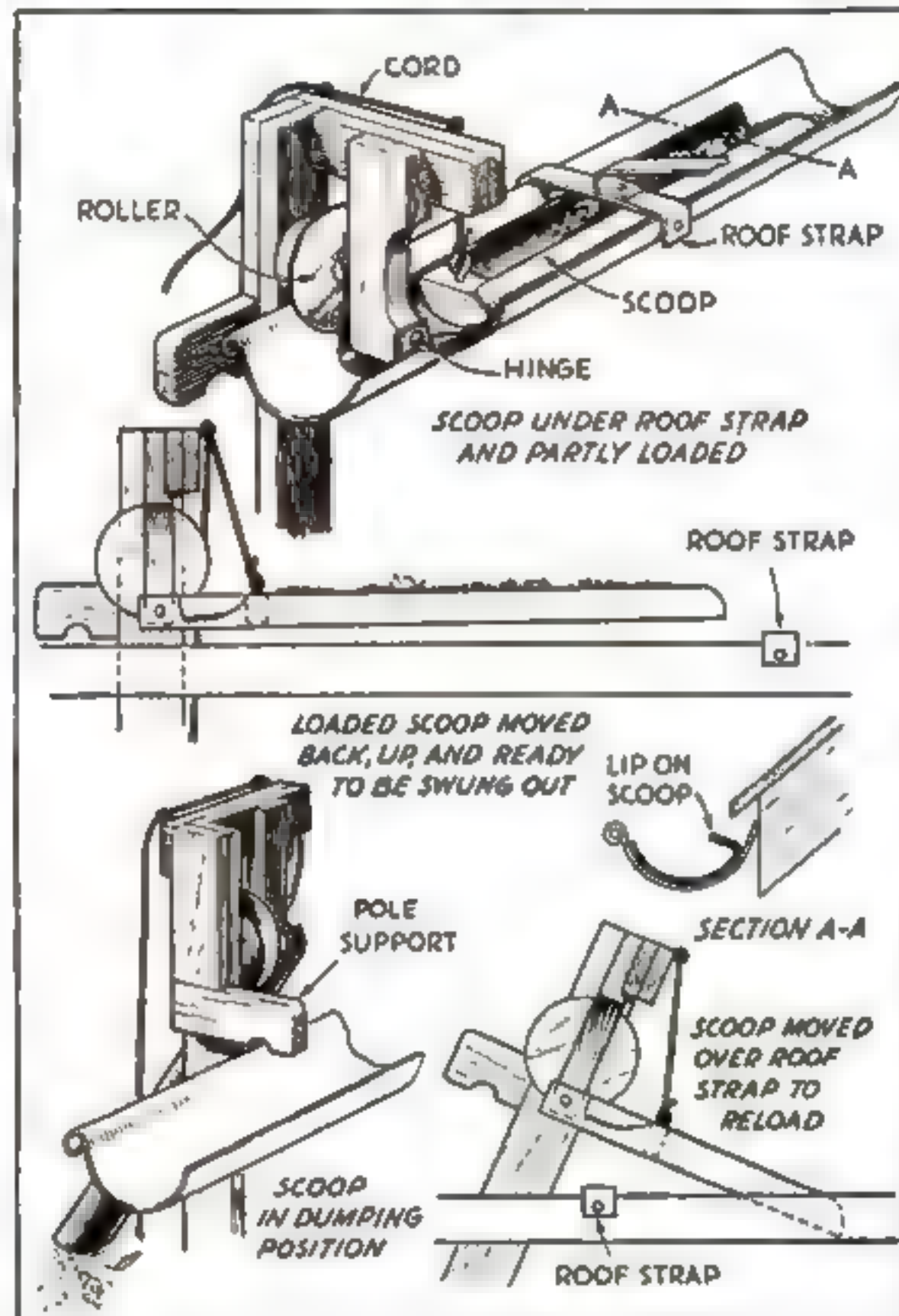
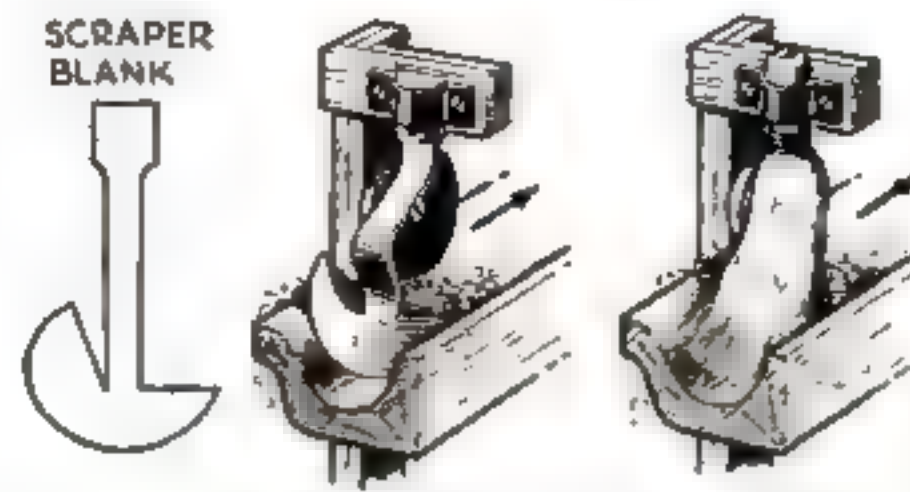
**W**HEN the eaves troughs or gutters of a house become clogged, cleaning them is a time-consuming, exhausting, and sometimes hazardous task. It involves, especially on a house more than one story high, raising and shifting a heavy ladder many times, climbing it repeatedly, and reaching out as far as possible to the right and left to scrape out the leaves and refuse by hand.

The same work may be done in safety and comfort from the ground by making a long-handled cleaning tool of one of the types illustrated. The principal materials required are two or three 12-ft. lengths of  $\frac{3}{4}$  by 2-in. furring strips or roof laths, as they are sometimes called; two sawed-out disks to serve as rollers, 1 in. thick and 3 in. in diameter; two sheet-metal (tin) disks 4 in. in diameter to serve as flanges; and a 26- or 28-gauge sheet-metal strip 14 in. by 2 ft. 6 in.

For eaves troughs of the box type or wooden gutters, it is sufficient to provide a stiff brush similar to a whisk broom and a simple spring-pressed

scraper. These are used alternately. Their lengthwise movement pushes the refuse ahead and discharges it over the side.

Gutters of the metal type, supported by metal straps from above, are more difficult to clean because it is impossible to roll the cleaning tool continuously along them. In this case a long, trowel-shaped scoop must be made and hinged to an overhead supporting member as shown in the rectangle above.

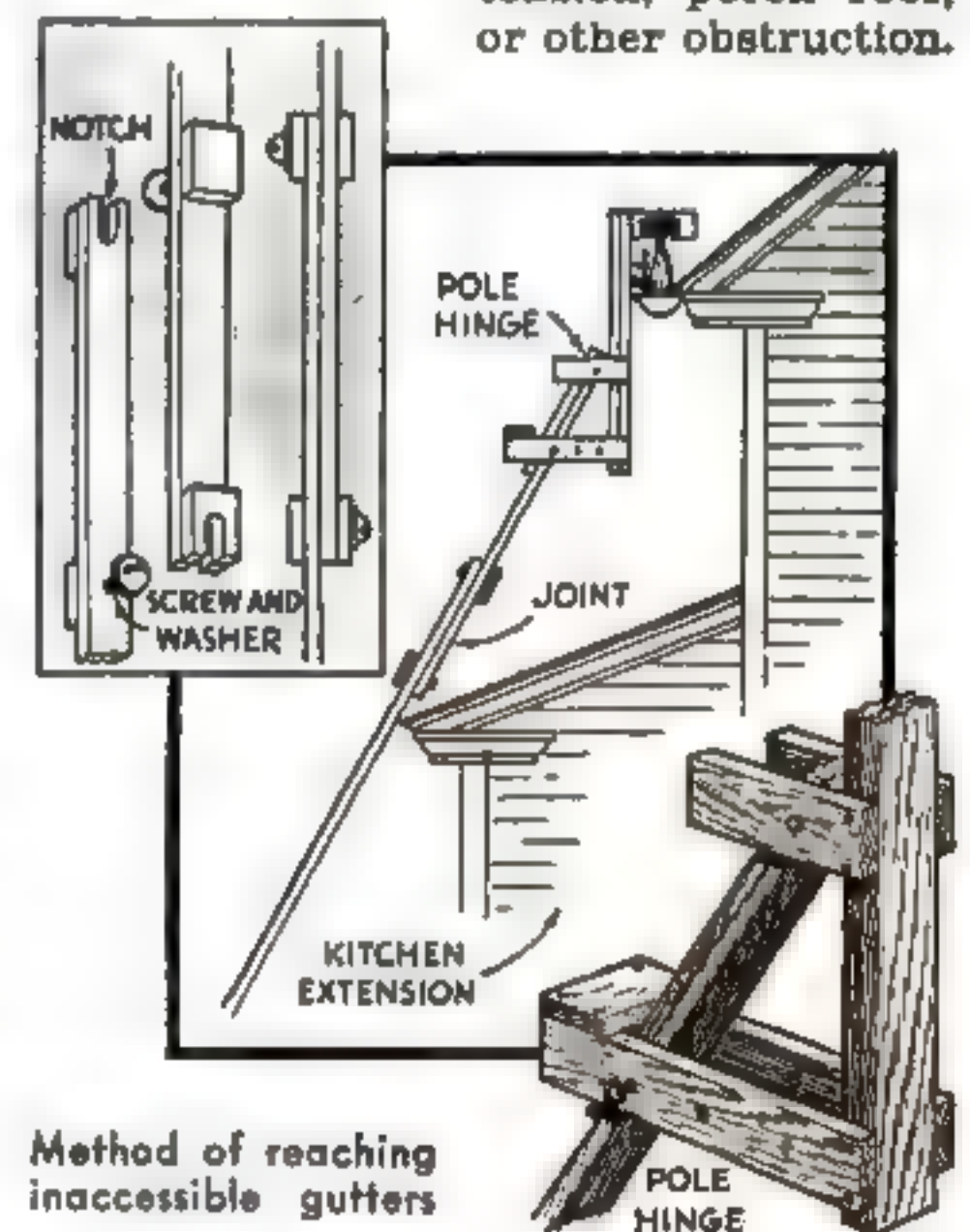


This tool is first rolled along and under a roof strap, picking up as much refuse as there is in the section of the gutter. Second, it is retracted from under the strap and slightly raised by a cord attachment to a horizontal position, the cord being made fast to the lower end of the long jointed pole. Third, the entire pole and the scoop with its load of refuse are raised slightly and swung a quarter turn, over the side of the eaves trough, then lowered sufficiently to enable the notched pole support shown in the drawings to be hooked on the outer edge of the gutter. Next, the cord is released to enable the scoop to drop to a dumping position.

To repeat the operations, the scoop is raised to a horizontal position by the cord, and the pole is lifted and swung to its former position. It is then carried over the next roof strap, and the scoop is lowered inside the gutter.

Note that a lip extending along one side of the scoop is turned over as in section A-A.

Since the pole must be kept perpendicular in use, a special bracket must be made as illustrated below when it is necessary to reach over a kitchen extension, porch roof, or other obstruction.



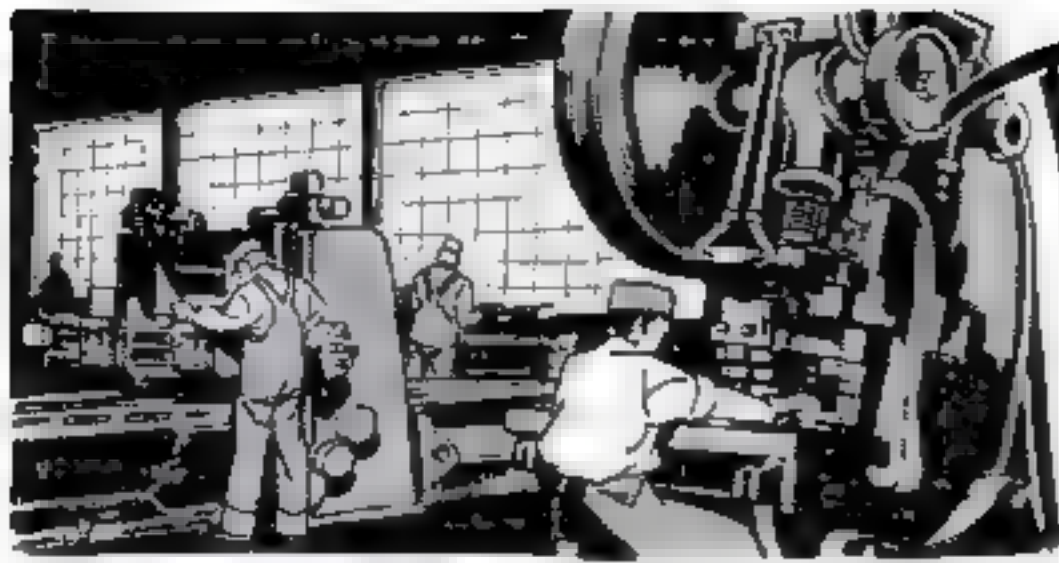
Method of reaching inaccessible gutters

## Keeping Paintbrushes Soft Between Coats



**PAINT** and varnish brushes can be kept in good condition for several hours between coats, or if one has to leave a painting job for a time, by wrapping them in heavy paper as shown and pouring enough turpentine into the paper pocket to wet the bristles thoroughly. The brushes will remain pliable, ready for use.—BROOKS HILL.

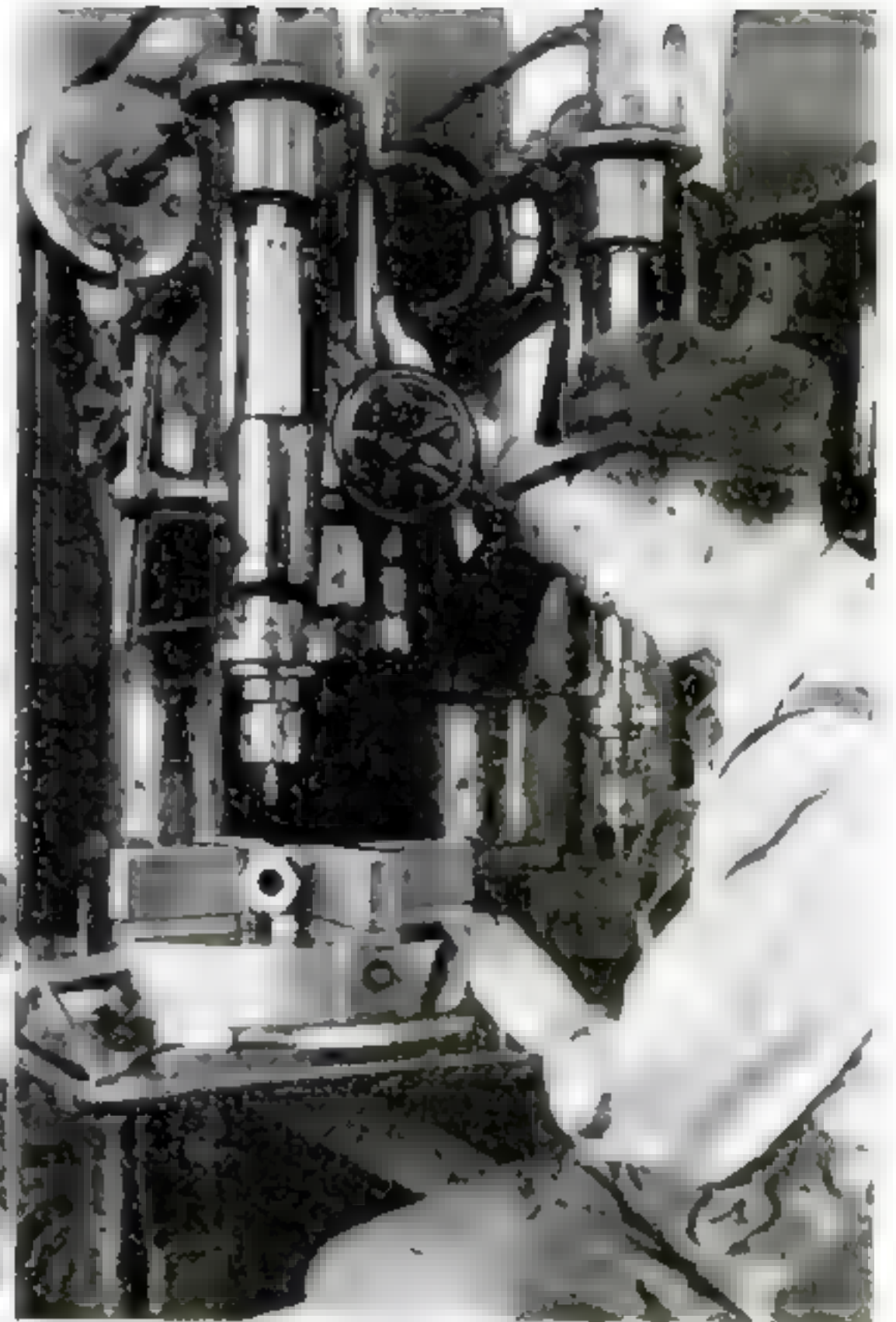




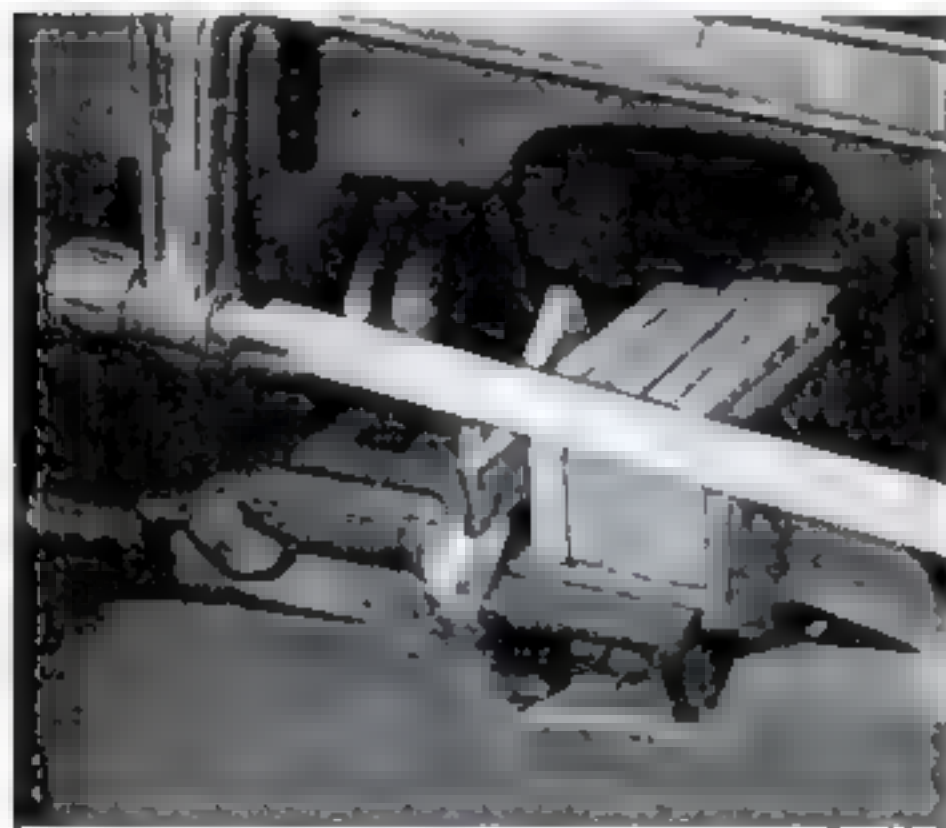
# Better SHOP Methods

## Lathe Chucks Speed Drill-Press Work

**E**ITHER three- or four-jawed lathe chucks can often be used to advantage for drill-press work. The chuck nose or adapter is removed, and a flat board  $\frac{3}{4}$  or 1 in. thick is bolted in its place, the holes in the wood being countersunk for the bolt-heads. The board can be cut away where necessary to clear screw heads or bolts in the chuck. Sometimes the work is chucked in the usual way. At other times, if there is a hole through the work, a bolt or machine screw may be made fast to a 1-in. thick steel plate held in the chuck jaws. Chucks are very useful for work in which many flange holes have to be tapped.—O. S.

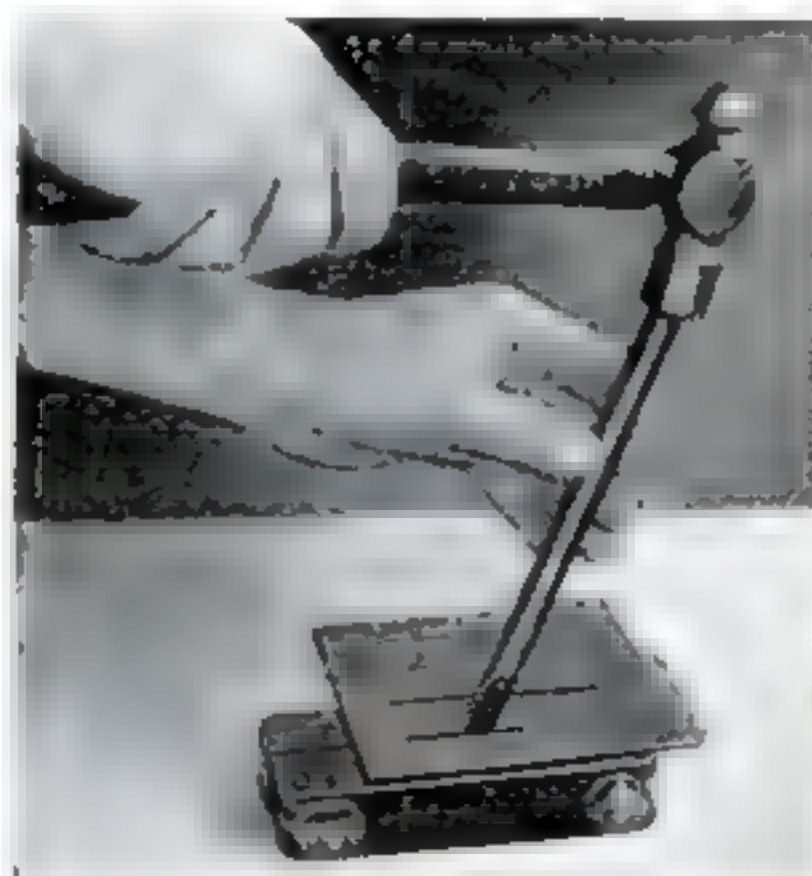


Lathe chucks are especially useful for holding work in which many flange holes have to be tapped. Left, the board bolted to back



## Cutting Stock at Angle with Power Hack Saw

It is frequently necessary to cut stock at an angle with the power hack saw. This may be done easily and accurately by placing a small piece of scrap iron in the vise alongside the piece to be cut at an angle and slightly above it, as illustrated above. This extra piece will act as a guide and hold the hack-saw blade true when it starts into the angle cut.—W. C.



## A Jig for Slotting Heavy Sheet Metal

**C**UTTING straight, narrow slots in heavy gauge sheet metal may be done rapidly with the homemade jig illustrated. It may also be used for trimming rough edges of large sheets and squaring up stock, or for cutting designs.

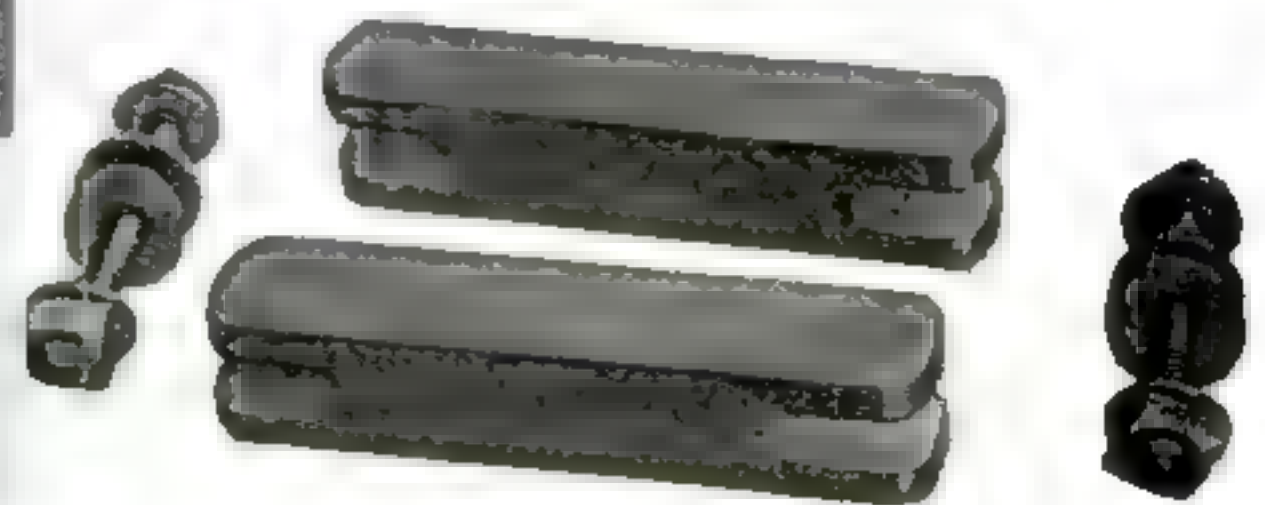
The jig consists of two pieces of square cold-rolled stock,  $1\frac{1}{2}$  by  $1\frac{1}{2}$  by 6 in., with slots cut in each end to accommodate the bolts. Adjustments are

made by means of spacing washers. For close work, a separate cutter for each size is necessary, but for all other operations any narrow cutter will do.

After a center line has been laid out on the work, a hole is drilled at each end equal in diameter to the thickness of the cutter to be used. The work is then laid on the jig, and the cutter is placed in one of the holes and struck just hard enough to drive a short

tongue of the stock down between the two bars; this is to hold the work in the jig while the cut is made from the other end of the line.—R. G. BULLARD.

Left, the tool, which in this case was made from an old round file, is held at an angle. Below, parts of the jig





# Welding Sheet Iron

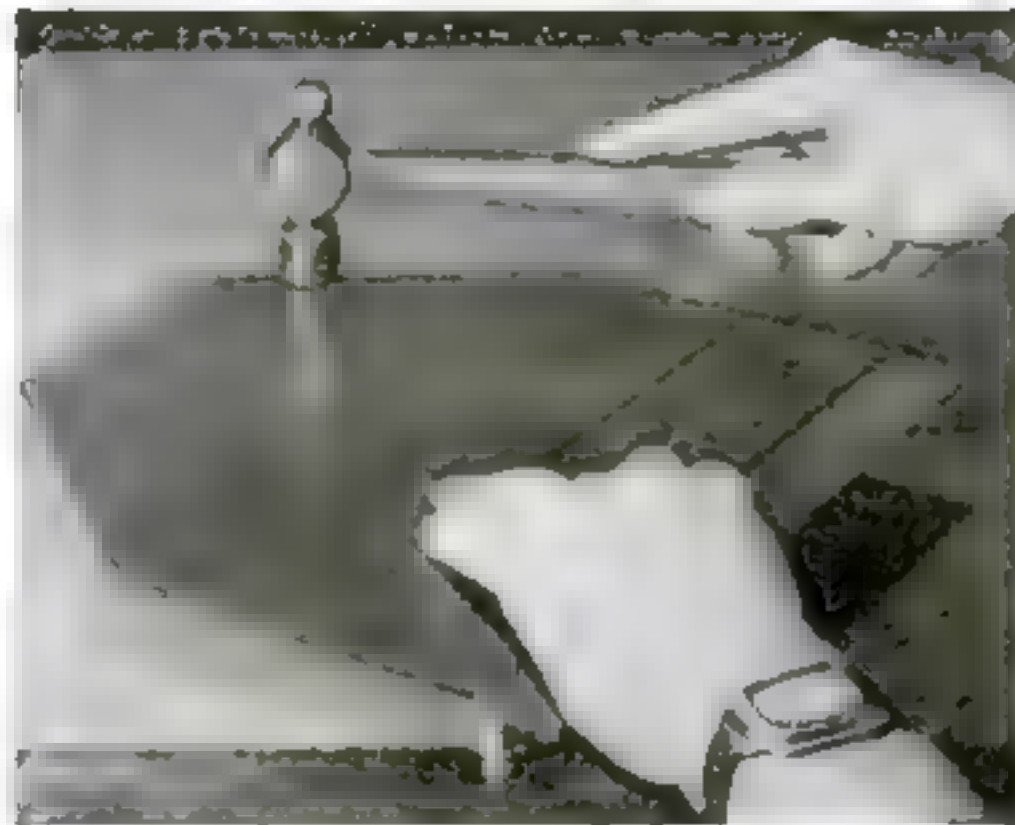
## WITH OXYACETYLENE

**L**ITTLE practice is required to learn to weld sheet iron of 14 gauge or lighter with the oxyacetylene torch. If the sheet iron is dead soft, no preparation is required, but if it is hot-rolled—and this is by far the most common variety—it is necessary to peen the edge of the sheets lightly in order to overcome the tendency of the metal to warp when the flame is applied.

The steel box illustrated, which is the housing of a public-address amplifier, is made of 16-gauge stock. The sides are blocked in position and the whole is spotted together at intervals of about 2 in. as shown. If the metal tends to warp, allow it to cool before making more spots. It is best to start at a corner and continue the spotting in the same direction around the seam.

The flame is held at about a 15-deg. angle to the seam, and the filler rod is held in a similar position from the other side. When both edges of the seam are molten for about  $\frac{1}{8}$  in., the filler rod is brought into contact with the work and the seam filled for that distance. When all the seams are spotted, start at a corner and follow the same procedure completely around the seam in the same direction and without interruption.

For this job a No. 2 tip is used with a  $\frac{1}{8}$ -in. diameter filler rod. The size of the flame depends on the operator's



When ordinary hot-rolled sheet metal is to be welded, it is necessary to peen the edges lightly to prevent difficulty from expansion

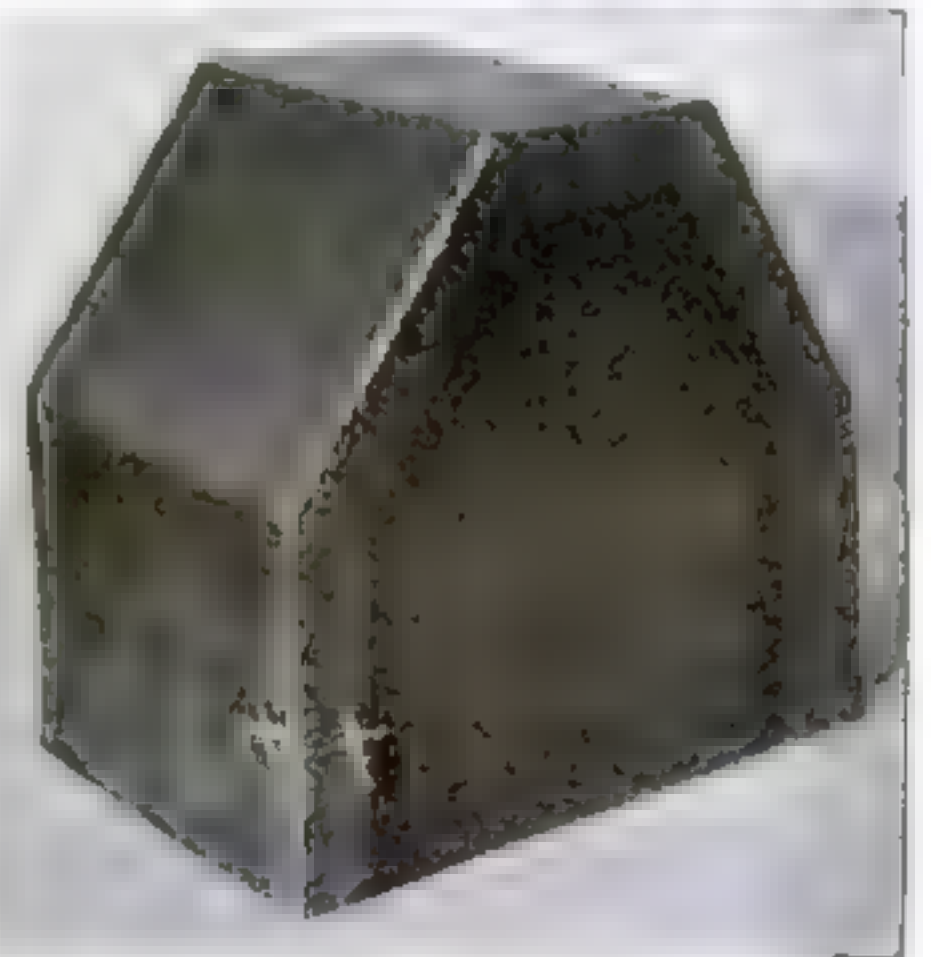
Spotting together the parts for a 16-gauge steel box. The spots are spaced about 2 in. apart. Note angle of torch and filler rod



skill. Set a pace that will not tire you; then regulate the flame so you can just keep the metal melted. In this way you will make a tight weld, and it will have a regularly rippled surface.

Until you are experienced, it is best to make the welds with the work level, but after some practice, you may run side seams and verticals. No one but an expert, however, should attempt to start at the top of a seam and weld downward.

Unless some special requirement calls for it, the metal to be welded must be kept free from all traces of foreign metals, especially tin and lead. Galvanized iron, nevertheless, may be welded because the galvanizing is burned off before the iron is heated to the melting point, except in the case of very thin sheets.—W. C. CHENEY.



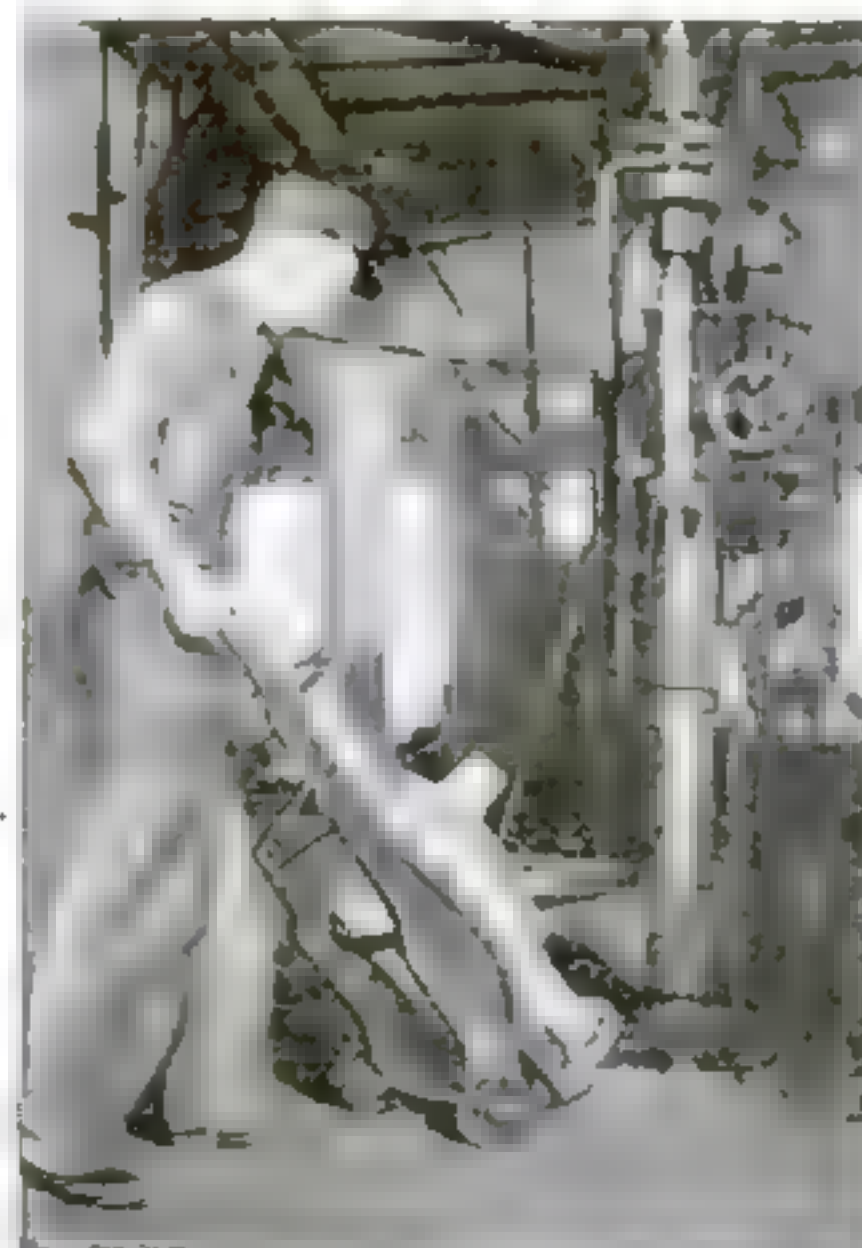
After being spotted, all seams are completely welded in a continuous operation



## Old Desk Lamp Supports Shop Magnifier

**S**MALL, delicate mechanisms such as electric clocks and meters are difficult to clean or repair properly without some kind of magnifier. A jeweler's glass, however, is so short in focus that the work must be held too close to permit certain tools to be used. For this type of repair, a better arrangement is to mount a 4-in. reading glass on the arm of an old desk lamp.

## Placing Heavy Castings on a Drill Press



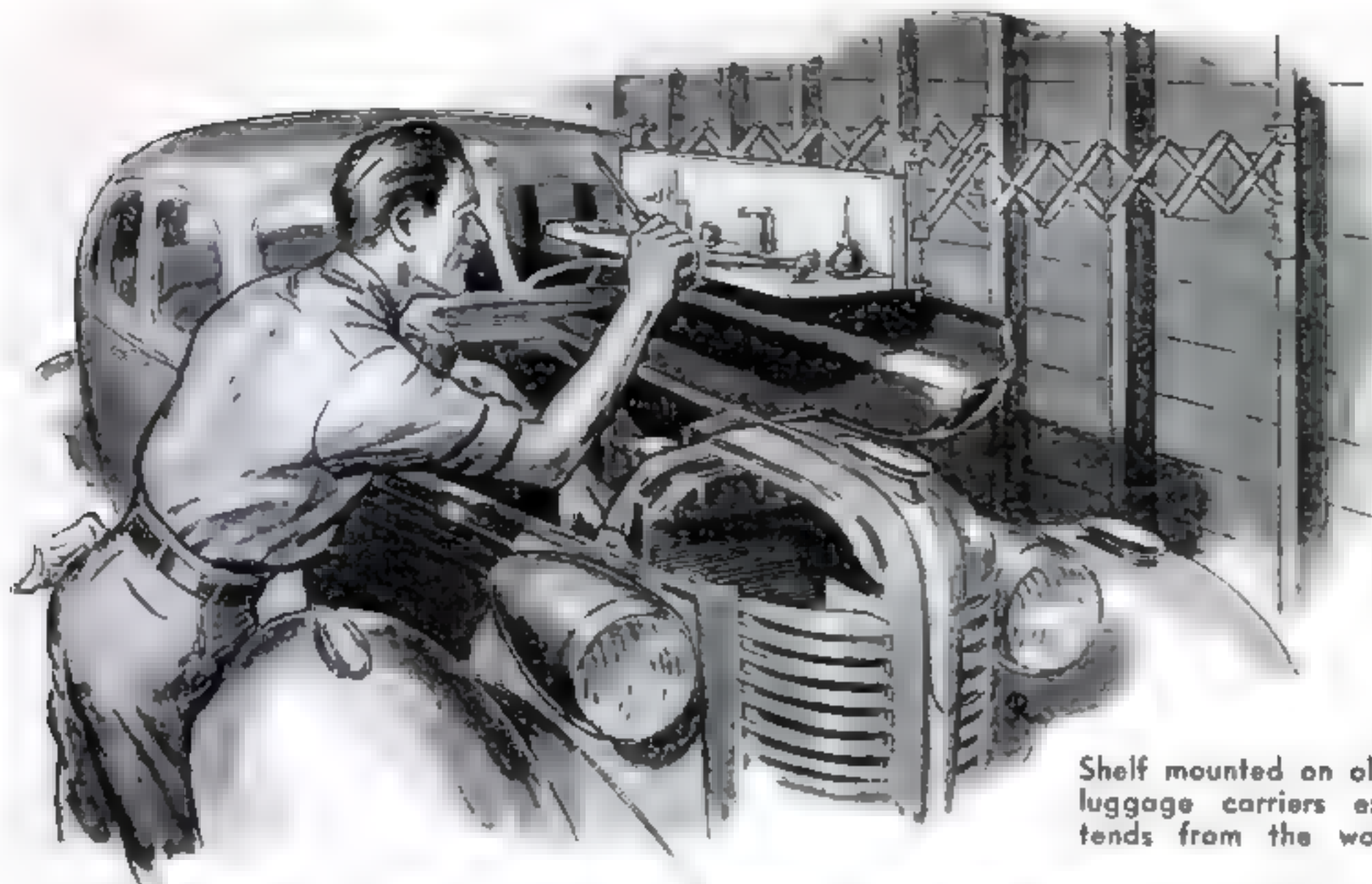
With a two-wheeled truck, one man can set this 400-lb. casting on the drill table for drilling holes in the flanges

**W**HEN a large, flat casting like the one illustrated has to be placed on a drill-press base, the natural tendency is to lift or roll it, but that requires two men and is heavy work. With a two-wheeled truck, one man can easily set the 400-lb. casting for drilling the flanges. He can also remove it with the truck and ease it to the floor.





# Useful Hints for Motorists



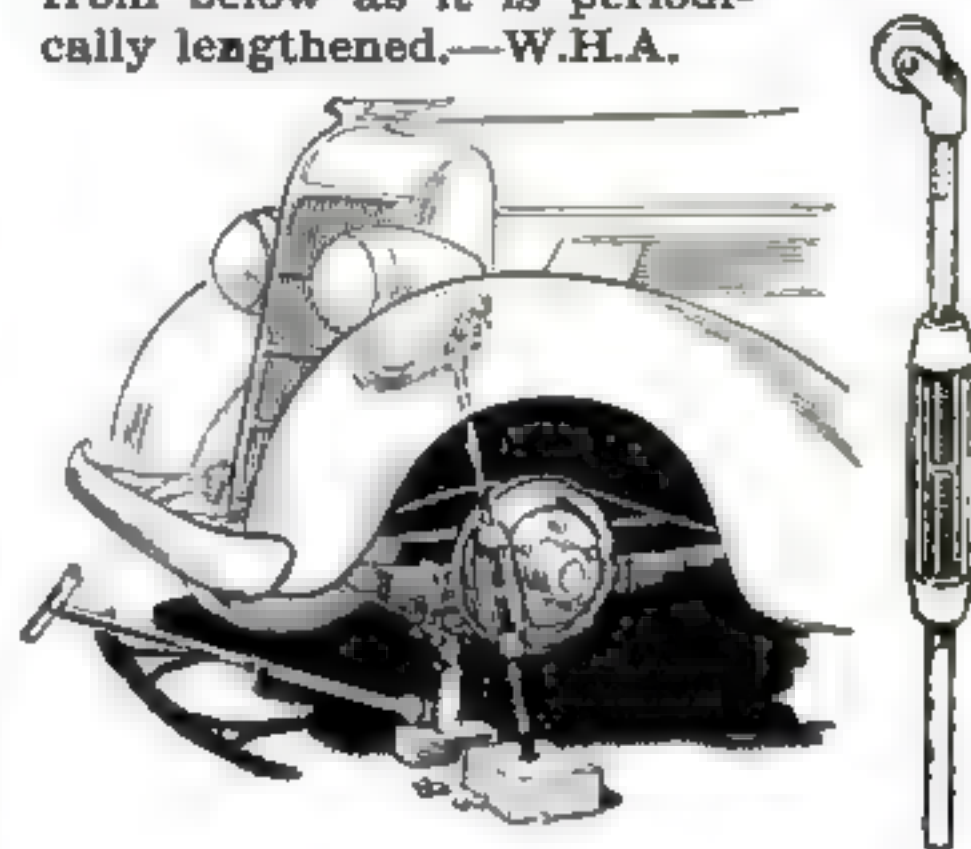
Shelf mounted on old luggage carriers extends from the wall

OLD luggage carriers of the lazy-tongs type, used on car running boards, can be adapted to form a movable tool shelf for the garage. Fastened to the ends of a simple wooden shelf,

two of the spreaders are attached to the garage wall so that the shelf can be pulled out to a handy position for the home mechanic working over a car motor.—A.H.W.

## Caster Removes Dents

DENTS in car fenders can be removed without hammering or marring the finish with a homemade tool consisting of a heavy turnbuckle with a sturdy furniture caster fitted into one end. As illustrated below, the turnbuckle is placed against a wood block, adjusted until the caster meets the underside of the dent, and worked back and forth from below as it is periodically lengthened.—W.H.A.



How the caster is mounted for rolling out dents

## Suction Cups Fit Ladder for Car Washing



The cups are bolted to U-shaped pieces of strap iron attached to the top ladder step

SUCTION cups attached to the top step make it possible to lean a step ladder against a car while washing it, with little danger that the ladder will slip or that the top step will scrape and mar the body finish.—K.M.

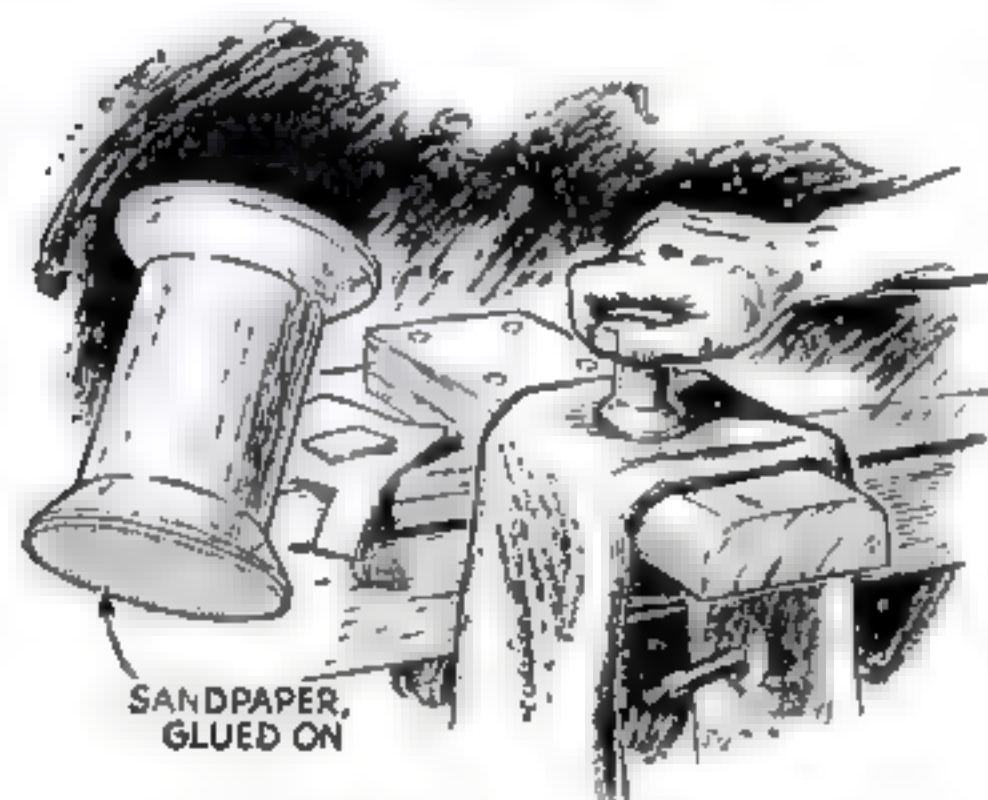
## Patches Silence Door

BY CEMENTING ordinary rubber tire patches to the jamb of a car door you can eliminate any play between door and jamb that may be causing annoying rattles in the latch.—W.H.



## Cleanser Curtains Car

HOUSEHOLD cleanser, rubbed on the windows of an automobile with a damp cloth, provides temporary curtains when the car is used for changing clothes at a bathing beach. The cleanser is easily removed by wiping the windows with a dry cloth.—H.A.W.



## Tube-Patching Rougher

A HANDY "rougher" for preparing inner tubes for blow-out patches can be made from sandpaper and a wooden sewing-thread spool. Cut out several disks from a sheet of sandpaper and apply them to the spool ends with glue or shellac.—H.A.

## Dust Mop Is Handy Polisher

LAST-MINUTE polishing of a car before setting off for a drive can be done safely without fear of getting dirt or grease on your clothes by using an ordinary long-handled dust mop to do the job. Be sure to use a new mop, however, not one that is saturated with floor polish or wax, which would dull the polish on the car body. A mop for the purpose may be kept always at hand.—M.P.



Last-minute polishing can be done easily without soiling the clothes



# Roadside Marine



A stick with a nail at the end for gathering specimens of algae from ponds

**N**EXT time you are out for a walk or a drive, take along a few small bottles or jars with tight-fitting caps, and collect some of the green scum that floats in the water of ponds, lakes, and stagnant pools, and that clings to the rocks of almost any stream. You can easily transfer small masses of the scum to your jars with the aid of a stick a yard or so long.

You may think this scum an unsightly mess, but under your microscope it will reveal itself to be marvelously beautiful. Besides, you can learn, among other things, how nature anticipated a

modern invention by some millions of years.

Pond scum is made up of countless slender filaments or threads of algae, among the simplest of plants. These threads, some of which are branched while others are simple strands, are very much like vegetable beads. They consist of rows of cylindrical cells strung together end to end. Although connected, these cells really are rugged individualists, for when separated from the chain, they continue to grow and reproduce just the same.

Threadlike algae are among the easiest objects to study with the micro-

**Scum from Stagnant Pools  
Yields Dainty Threadlike  
Plants That Are Fun To  
Study with the Magic Lens**

**By  
MORTON C. WALLING**

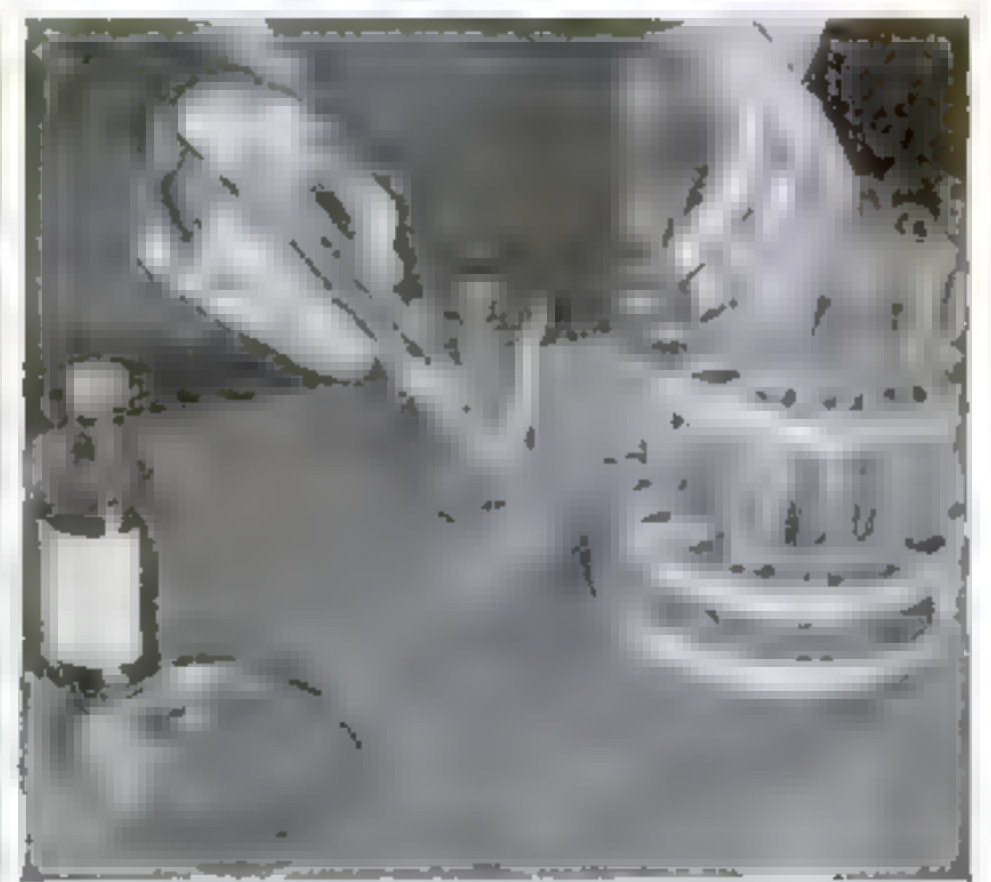
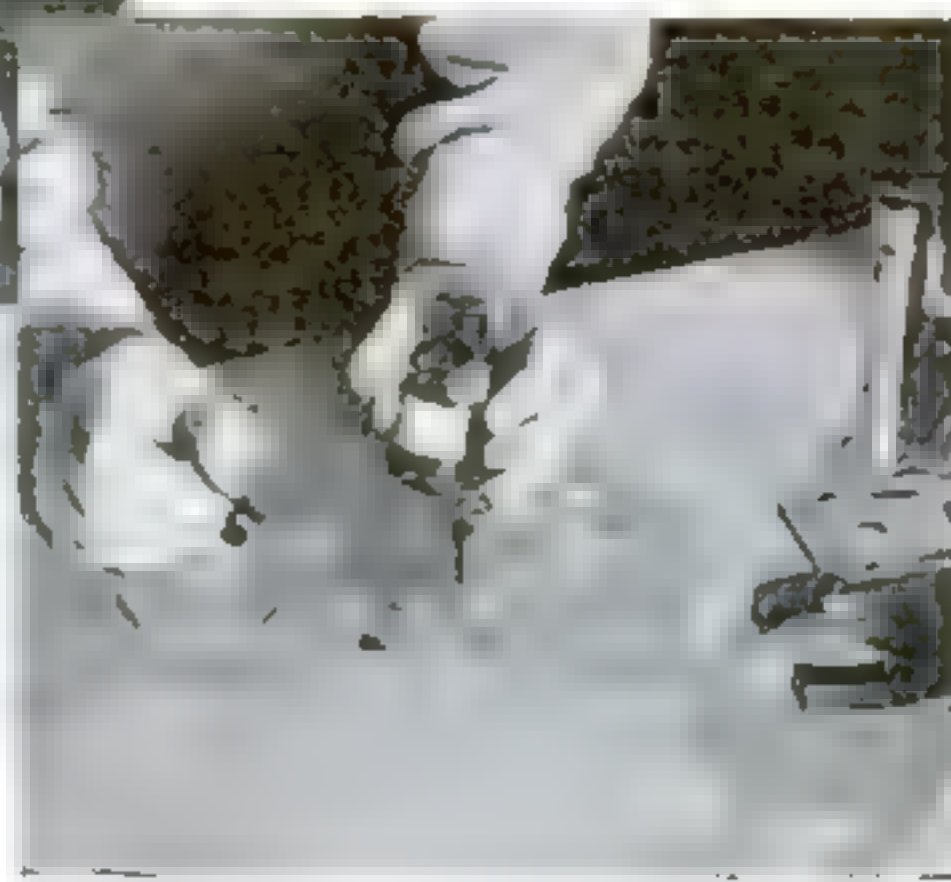
• • •

scope. All you need do is to place a few strands on a clean slide in a drop or two of water and add a cover glass. So abundant is the supply of material that you seldom need to make permanent mounts. Algae can be found even in winter, in ponds and streams. The filament kinds, although more difficult than others to cultivate, can be kept for some time in an aquarium or in laboratory jars. Simply place some pond water containing the algae into a jar, and add an inch or so of solid material from the pond bottom.

Today you hear much about transparent cellulose film being used to wrap things of many kinds—chewing gum, cigarettes, Christmas packages, bathing beauties, and pianos. This cellulose wrapping material has been available to human beings for only a relatively few years, yet nature, the

## PREPARING ALGAE SPECIMENS FOR EXAMINATION

At the right, specimens taken from a jar are being placed in a shallow dish for rough examination, as at left to determine whether the desired forms are present. Below, selected strands have been placed on a slide and are being stained with iodine. Lower right, shaking blue-green algae in chloroform and water to reveal presence of chlorophyll





# Gardens

## EXPLORED WITH YOUR MICROSCOPE

champion of inventors, used it ages ago, and still employs it in great quantities.

The cells of the algæ threads are proof of this. Each is wrapped in a film of transparent cellulose. This material forms much of the outer membrane of the cell, and probably has a lot to do with protecting the contents against outside conditions. In some of the threads, you will see empty cells, in which the cellulose capsule is clearly visible. These cells probably were emptied by some water creature that lives on the plants. In fact, you can observe such tiny animals apparently feeding on the cell contents.

The cell walls of such plants as *Spirogyra*, one of the most beautiful forms, are not simple films of cellulose. There are, in addition, layers of cuticle and mucilage outside the cellulose, and a lining of cytoplasm, or outer cell material inside. But you probably will not be able to see these different layers with your microscope.

The protoplasm inside the cell contains such things as the cell nucleus, usually in the center; vacuoles, or liquid-filled cavities; and chromatophores. The chromatophores, or color-bearing bodies, are often the distinguishing features of an alga plant. For instance, *Spirogyra* gets its name from the green spiral bands encircling the cells on the inside, and forming a beautiful pattern. In other kinds of threadlike plants, the chromatophores are arranged like stars, strings of beads, plates, and disks.

In some of these simple plants there are, within the green-colored material, small bodies called pyrenoids. Research



Algae plants from a mass of lake scum. At left is a filament of the common *Spirogyra*

has shown that these bodies are surrounded by starch,\*and that they contain albumen. Their purpose is not known definitely, but it is thought that they form reserve stores of food.

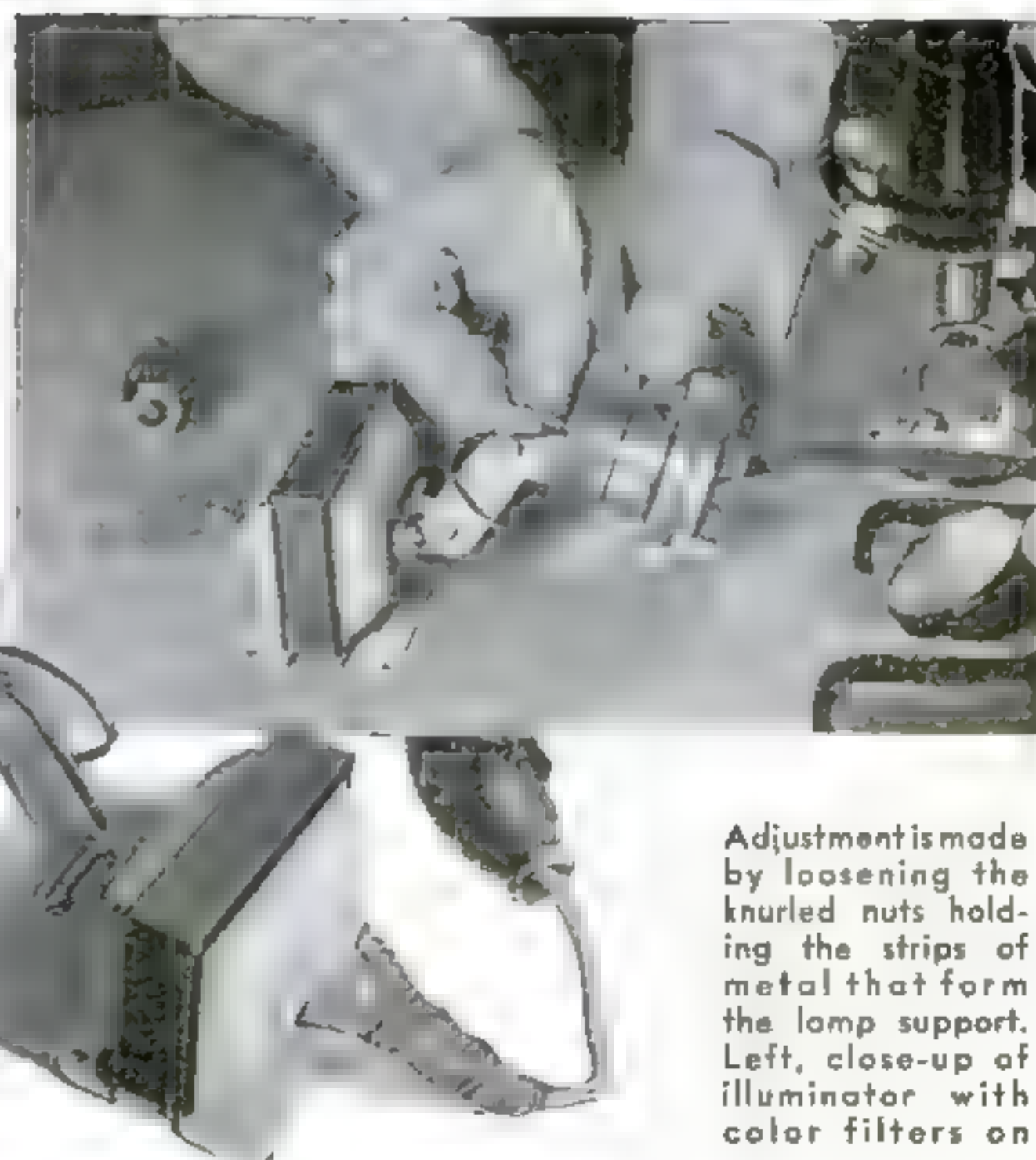
There are so many kinds of algæ—some 10,000 species are known—that it would be impossible even to name them all here. The filament types are numerous and abundant. *Spirogyra* is one of the best known and easiest to find. The average *Spirogyra* filament is about the diameter of a human hair, and each cell is about four times as long. The entire filament averages about five centimeters (nearly two inches) in length.

Other hairlike algæ that you may encounter include *Genicularia*, which has spiral chromatophores resembling those in *Spirogyra* but is considerably smaller; *Zygnema*, characterized by two star-shaped chromatophores in each cell, and usually found near the surface of water; *Cedogonium*, which often has a membrane marked with sharp ridges and grooves running across one end of cell; and *Pithophora*, which forms resting spores that are bulb-shaped, dense, and considerably larger in diameter than regular cells.

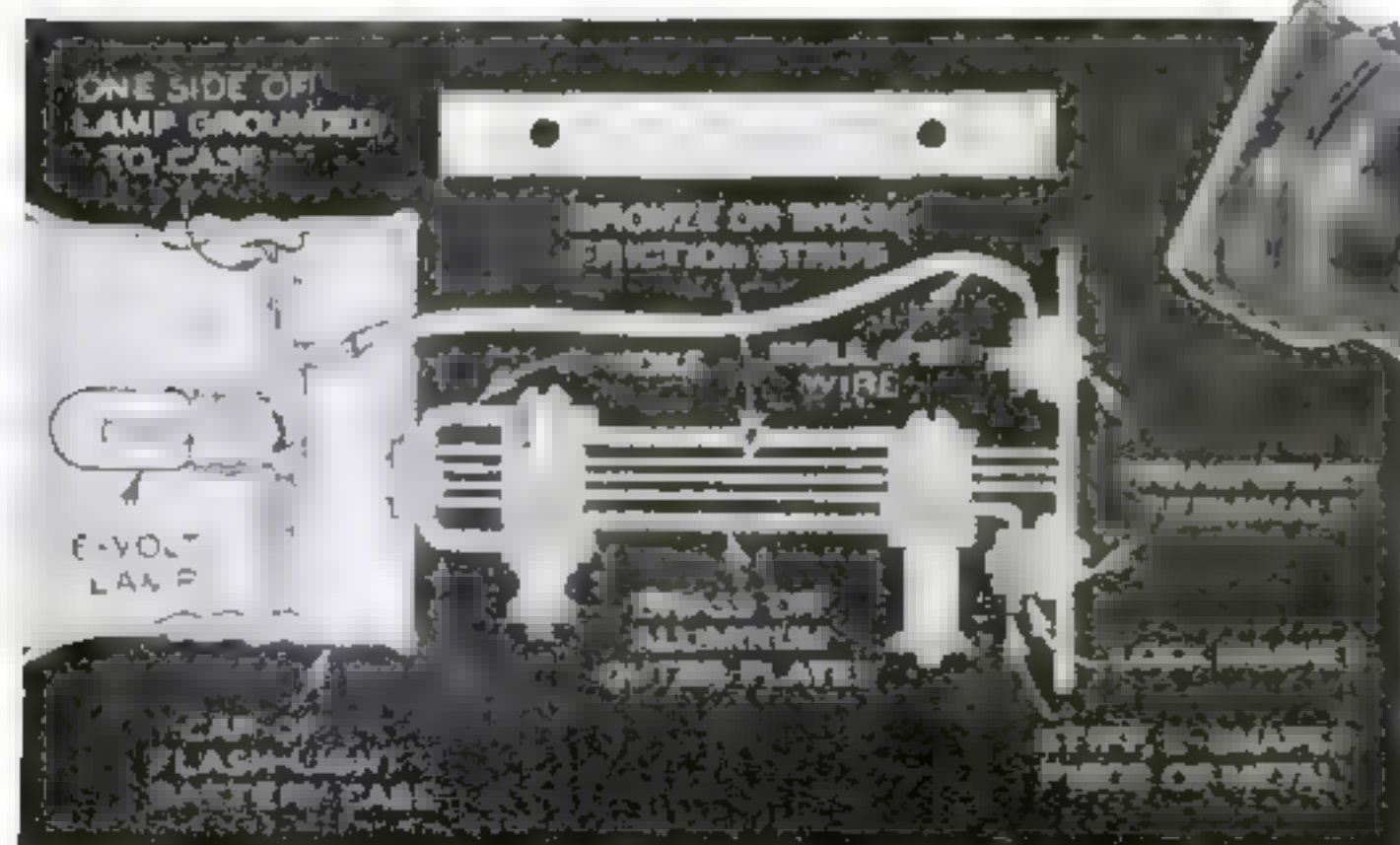
Pond scum is green because of the presence of *(Continued on page 96)*

## HERE'S A HANDY MICROSCOPE ILLUMINATOR THAT'S EASY TO MAKE

FROM a six-volt doorbell transformer, an old flash-light case, and a radio-dial lamp, you can make a microscope illuminator that will prove useful in examining many kinds of subjects. As shown in the illustrations, the two ends of the flash-light case are combined to form a lamp housing which is mounted on the transformer as a base. For even diffusion of light, grind both surfaces of the flat "lens" with moistened abrasive powder to give a ground-glass effect. Clips soldered to the lamp hold color filters.



Adjustment is made by loosening the knurled nuts holding the strips of metal that form the lamp support. Left, close-up of illuminator with color filters on



How the illuminator is assembled and mounted on the transformer



# Is Water Always Wet?

Simple Home-Chemistry Tests Prove That It Is Not, and Show Us That Many of Our Other Familiar Beliefs About Everyday Things Are Wrong

By RAYMOND B. WAILES



This simple experiment shows you how glass can become an electrical conductor—under certain conditions. Heat accomplishes the trick.

"GLASS is a nonconductor of electricity." Mighty few people would ever dream of questioning that statement. And it is true—usually. But the fact remains that you can make electricity run right through a strand of glass, and light a lamp, in your own home laboratory.

Other easy experiments will show you that water is not always wet; that a widely held belief about the way that soap cleans things is all wrong; and that, with the advantage of an amateur laboratory at your disposal, you can afford to be a little skeptical about unqualified statements that many people accept without question.

Take glass, for example. Insulators are made from it. Certainly it must be an electrical nonconductor. It is one of the best, in fact, if you add just a few qualifying words—"at ordinary temperatures." What happens when glass gets hot will be interesting to test.

For a source of electricity, the regular 110-volt house supply will do nicely. A lamp bulb of sixty to 100 watts will indicate any flow of current, and will keep it within reasonable bounds.

Attach a short length of electric wire to one of the terminals of a lamp socket. Connect the other socket terminal to one of the pair of wires of an extension cord having an attached outlet plug. This will leave two free ends of wire. Remove the last two inches of insulation from each one, leaving the copper wires bare. Then thrust the ends into pieces of glass tubing, which will serve as insulating handles, so that the cleaned end of one of the wires

extends from the end of its glass tube. Plug in the extension cord and screw the lamp bulb in the socket.

Hold the exposed wire tip against the outside of the tube enclosing the other so that only a single wall of glass tubing separates the copper tips, and apply heat with the flame of a Bunsen burner or an alcohol lamp, preferably the former. Presently you will observe a yellow glow in the glass separating the wires. With continued heating, the glow becomes a white arc, caused by electric current flowing through the heated glass. Now you can remove the tubes and wires from the flame. The current

will continue to arc through the molten glass at the gap between the two wires. The experiment also works if both tips are enclosed in their glass tubes. Then you can try pulling out the softened glass, like taffy, a fraction of an inch. The glass remains molten and the current keeps flowing. Though the indicating lamp bulb grows dimmer as the arc is lengthened, it stays lit, showing that hot glass will conduct electricity.

Either direct or alternating current may be used for the test just described. The arc is a brilliant one and it is best to shield your eyes from it with sun glasses or tinted goggles.

An interesting side light of this experiment is the fact that the copper wires are electrolytically destroyed and unite chemically with the glass. When the tubing has cooled, look at the part where the arc occurred. You will find the glass colored green. An oxide of copper is the coloring agent. Repeat the experiment with wires of other metals than copper, and you will be able to produce glass of different tints.

How do-a soap clean your hands and clothes? Here again, a little healthy skepticism about widely accepted ideas is in order.

Many people, including chemists, have long believed that soapy water removes grease by dissolving it. A strong alkali would certainly do so. But tests have shown that any alkali existing in soap would be so dilute that it couldn't possibly dissolve a grease spot. What actually happens when clothes are rubbed with soap is that the soap forms an "emulsion" with the grease. In other words, the soap penetrates the grease and breaks it up into minute droplets,



Lampblack in plain water fails to penetrate the filter. But if soap is added, lampblack clings to it, passing through, showing one way that soap cleans



with which it forms a cohesive mixture. Separated from each other and from the cloth by soapy water, the droplets of grease are easily washed off.

As for the way that soap removes solid particles like soot, that is another story, which you can readily investigate for yourself.

**S**ELECT a pair of flasks with a capacity of 250 cubic centimeters, or about a glassful, apiece. Half-fill each flask with water and add to it several grams, or about a spoonful, of a sooty material such as lampblack or very finely powdered charcoal. Jeweler's rouge, which consists of ferric oxide, can also be used; you can make it for yourself by heating ferrous sulphate in a porcelain evaporating dish or crucible, or in the lid of a tin can, until the preparation becomes entirely red.

To one of the flasks, only, a gram or two of soap powder or a small piece of soap should now be added. Shake both flasks for half a minute. Then filter half the contents of each flask, through separate filter papers placed in funnels, into test tubes. The filtrate from the flask containing soap will contain some of the soapy material, while the filtrate from the soapless flask will be clear. Let the remaining liquid in each flask stand for half an hour. At the end of this time you will find the soapy liquid is still dense and opaque; the liquid in the other flask will be clear and transparent, the soot having settled to the bottom.

All this becomes understandable when you realize that soap forms a "colloidal" solution in water. That is, part of the

With the "oil-cracking" plant below you can make the little-understood "firefly glow" in your laboratory



Water will not readily wet powdered charcoal dumped on its surface, causing it to stay afloat

soap is not dissolved, but is suspended in the water in the form of tiny solid particles. Evidently the soap particles and the soot particles stick to each other so strongly that the soot goes through the filter with the soap instead of clinging to the pores of the filter paper. The theory is confirmed when you find soot particles still suspended in soapy water, after half an hour, while in clear water they settle to the bottom. It is this cohesion between soot and colloidal particles of soap that overcomes the tendency of the dirt to cling to other surfaces, such as your skin or clothing. Thus soap really has two distinct actions—it emulsifies grease to make it easy to wash off, while colloidal soap particles stick to the soot and carry it off bodily.

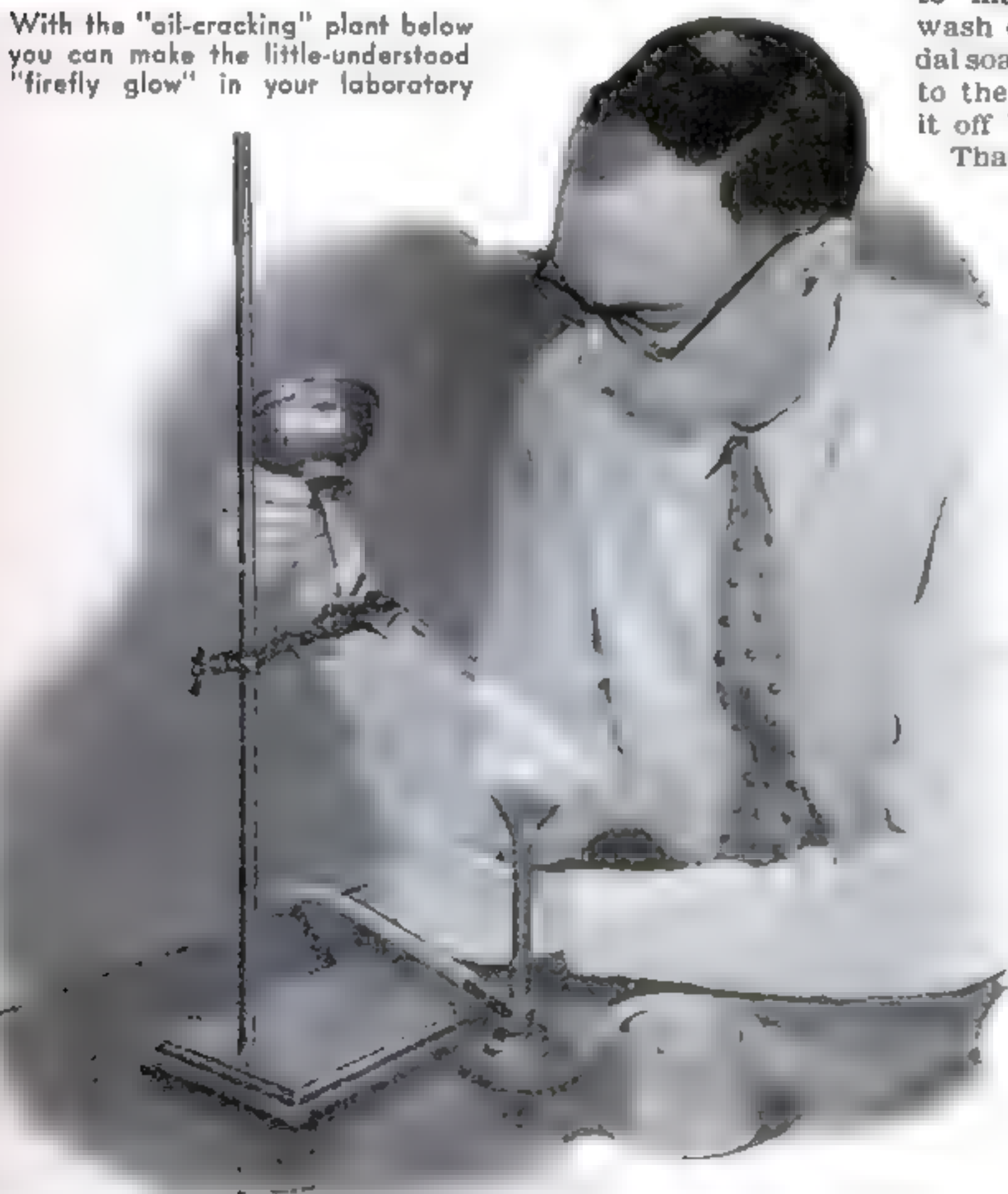
That water is not

always wet makes an entertaining demonstration. A familiar version is the parlor trick in which lycopodium powder is sprinkled on the surface of a bowlful of water. Then you can thrust your hand right into the water and withdraw it perfectly dry. A little film of air, adhering to each grain of powder, effectively prevents the water from reaching the skin.

Shop workers encounter the same effect when they try to form a paste by adding water to certain kinds of powdered glue, or to the so-called "iron-cement" powders. At first, the water simply refuses to wet the powder and is shed in drops until the mixture has been forcibly ground together for some time. A simple short cut, however, is to add a drop or two of alcohol to the powder before mixing it with water. The alcohol displaces the film of air and allows the water to come in contact with the solid material.

A little experiment in physical chemistry, illustrating the same phenomenon, shows strikingly that some substances are much more easily wet than others. Grind up some glass in a mortar with charcoal or lampblack, taking care to protect your face from flying particles of glass. This may be done by covering the mortar during the grinding with a rather heavy cloth about eight inches square, having a hole cut in the center for the pestle. From a small sieve or beaker, sprinkle the resulting charcoal-glass mixture upon the surface of water in a tall vessel such as a graduated cylinder or beer glass.

**T**HE transparent particles of glass will separate magically from the charcoal, instantly sinking through the water to the bottom of the vessel. Floating on the surface of the water, the charcoal remains behind. The glass is readily wet, while the charcoal clings to a film of (Continued on page 94)



Turning down the set screw of the radio ground clamp loosens the stopcock safely



## Clamp Loosens Glass Stopcocks

**W**HEN the stopcocks of separatory funnels and burettes become frozen in their sockets, they can be loosened by applying pressure with a small, radio ground clamp, as shown. The large-shouldered end of the socket should rest upon the twin legs of the clamp, which are padded with adhesive tape. Tightening the screw gently should then force the stopcock out. If it is stubborn, let it remain under tension several hours, and it will often pop out.



# Smoker's Radio

## HAS HUMIDOR AND PIPE RACK

By Frank Tobin

**P**ROVIDING a handy tobacco humidor and a pipe rack, as well as an efficient four-tube broadcast receiver, the smoker's radio illustrated will form an attractive and useful addition to your den. Operating on either alternating or direct current and requiring only a short antenna and no ground, the outfit can be plugged into any outlet and used on a desk, a side table, or a mantelpiece.

Because of the small aluminum chassis (1¼ by 3¾ by 5½ in.) used, standard midget parts were employed throughout the circuit. Even the loudspeaker is a dwarf measuring little more than three inches in diameter. Electrodynamic speakers of this type are available at most radio parts supply houses and give surprisingly good tone. Due to their small size, the output transformers for these speakers (also midget in size) are not mounted directly on the framework, but are sold separately. As a glance at the photographs will show, I mounted the unit to one side of the speaker, directly beneath the antenna coil.

The coils used in the set are also of the midget variety. Since unshielded coils of that size are not very common, it will be necessary to purchase two shielded units and, with the aid of a screw driver, remove the shielding can. The antenna coil is mounted above the chassis to one side of the loudspeaker, while the radio-frequency coil, connecting the radio-frequency tube to the detector tube, is mounted underneath the chassis, directly behind the volume control.



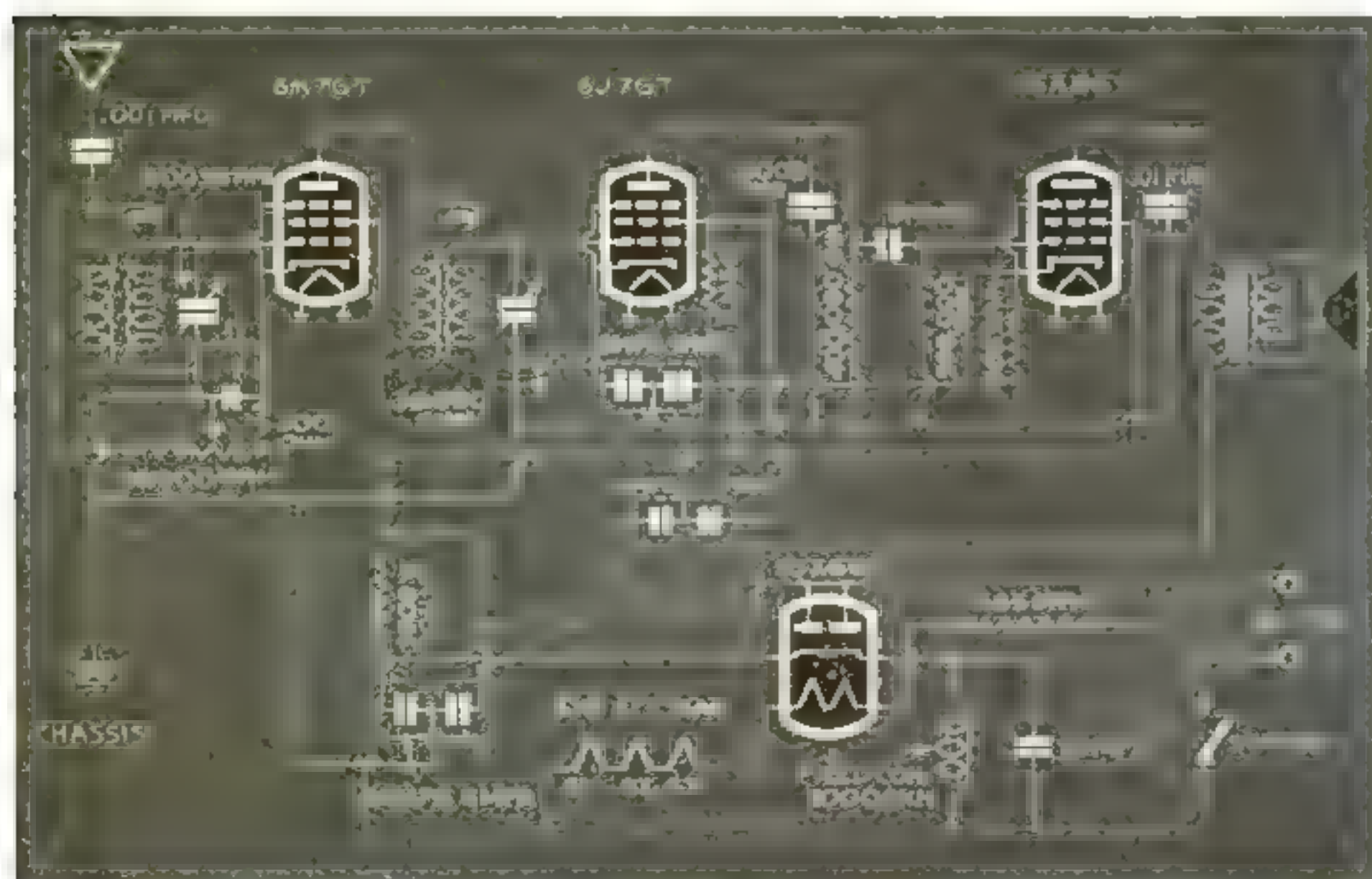
A real desk companion—tobacco humidor, six-place pipe rack, and radio combined

The volume control has a resistance of approximately 20,000 ohms and has a built-in switch. Care must be taken to buy a volume control with a maximum diameter of not more than 1¼ in., otherwise it will not fit on the chassis. In series with the volume control is a small ½-watt, 300-ohm resistor.

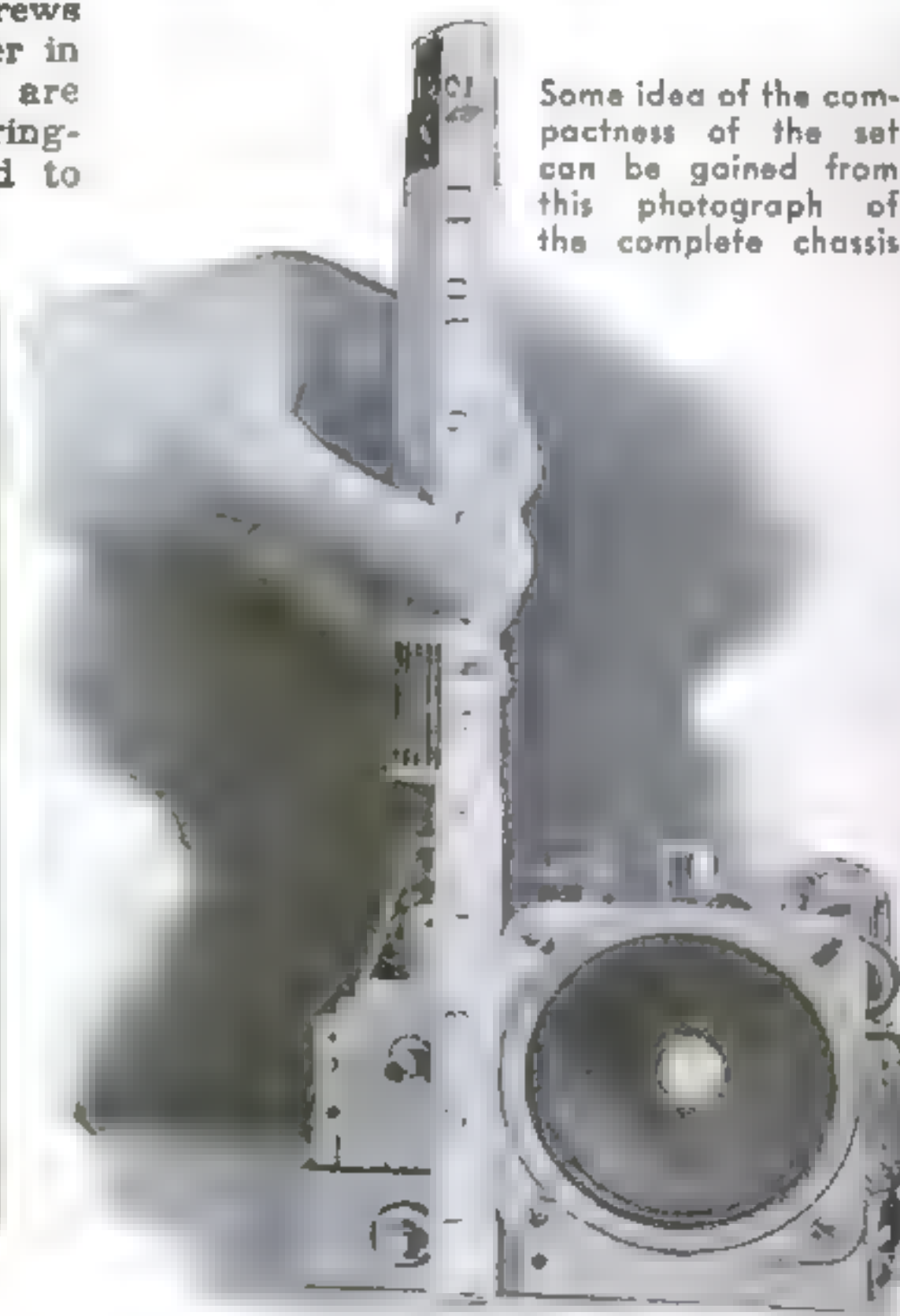
Ordinary wafer-type tube sockets cannot be used in this design as the tubes are placed so close together that there is no room for the conventional mountings. Instead, a new kind of socket requiring no mounting screws was used. These sockets, no larger in diameter than the base of a tube, are held in place by a tempered spring-steel ring. They can be obtained to

fit any chassis measuring from .030 to .065 inches in thickness. And the thickness of the chassis must be specified when buying the sockets.

Designed specially for use in midget sets, the tubes used in the circuit are a new development (P.S.M., July '38, p. 78). Fitted with octal bases they are no larger than the all-metal types. In order to facilitate the wiring and grouping of the parts, the tubes are not arranged in the usual fashion along the chassis, the power pentode (25A6GT) being mounted between the

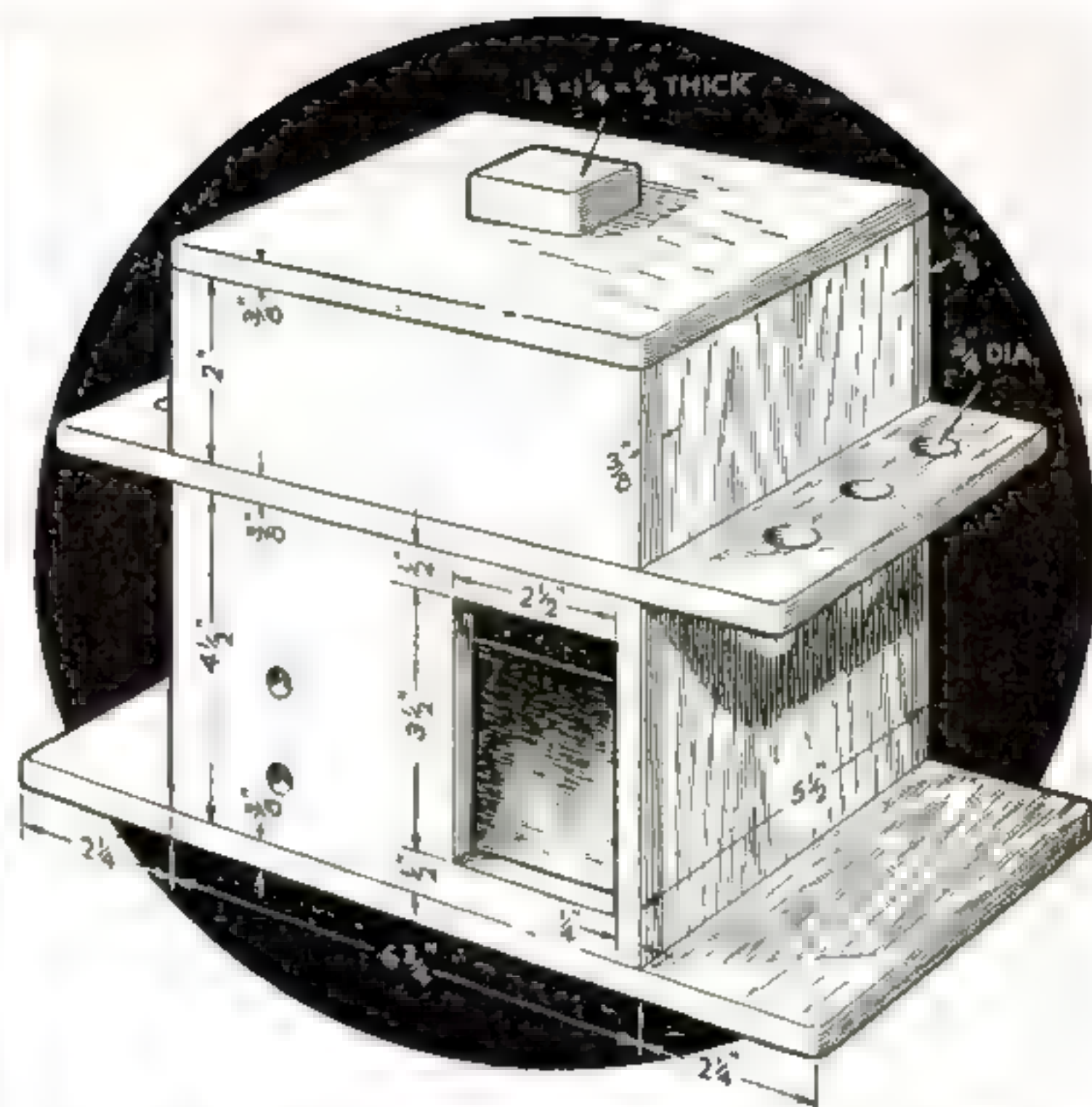
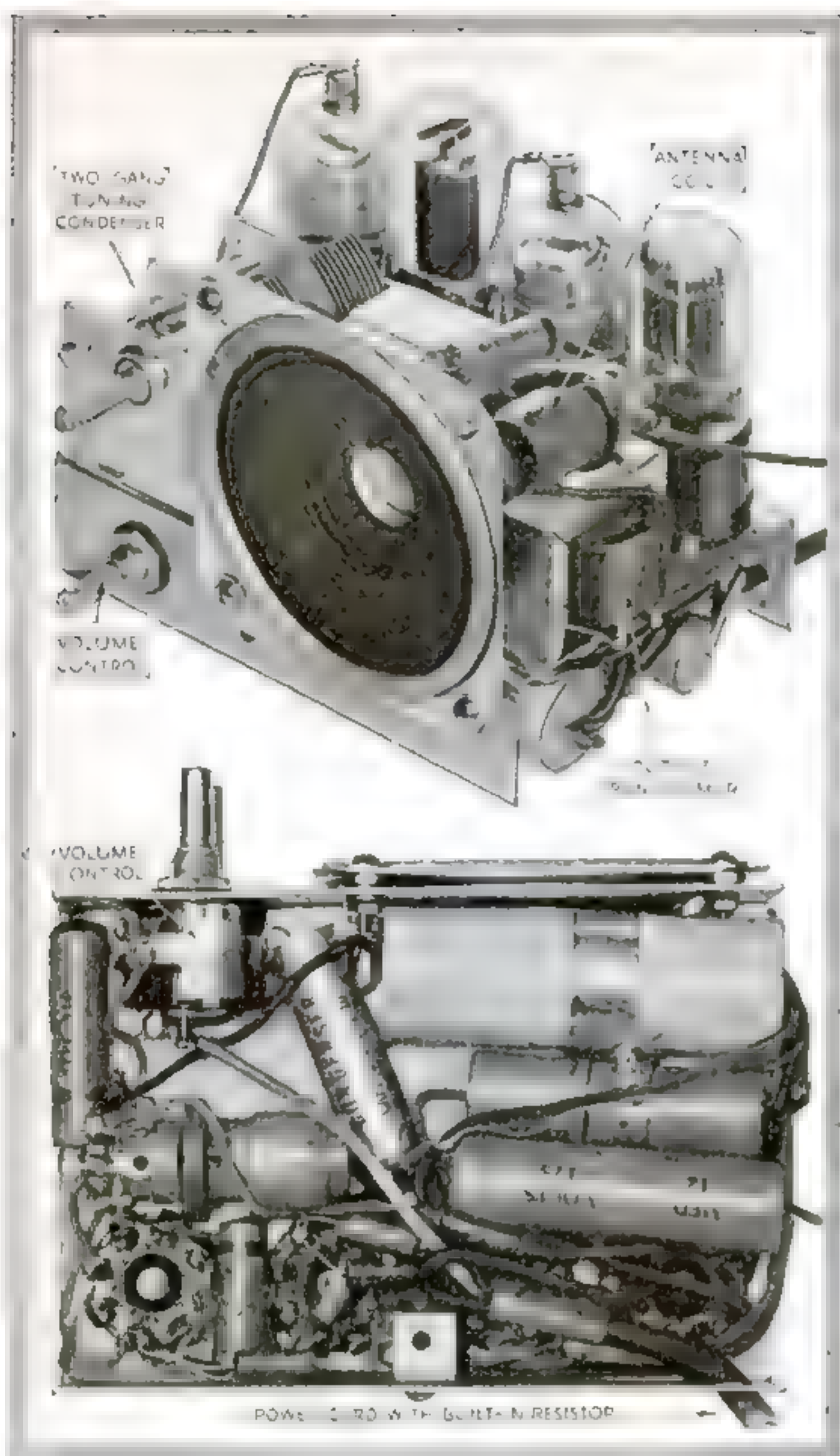


Midget tubes and parts are used in assembling the four-tube A.C.-D.C. circuit



Some idea of the compactness of the set can be gained from this photograph of the complete chassis





Ordinary enamel provides a good finish for the pine cabinet



two radio-frequency pentodes (6K7GT and 6J7GT).

No filter choke is used, a one-watt, 5000-ohm resistance being employed instead. This, of course, results in a considerable saving of space.

Additional space is saved by the use of "dual-section" cartridge condensers. These are plainly indicated in the wiring diagram and consist of two fixed condensers mounted in the same cardboard container and provided with a common ground connection.

The cabinet may be easily constructed at home. All necessary dimensions are given in the sketch. The wood used was 3/4-in. pine. When assembled, the cabinet was first given a coat of orange shellac to close the grain. After that a single coat of brown enamel was applied over the entire exterior. The interiors of the top and bottom compartments were coated with ivory enamel.

To prevent the heat of the tubes from drying out the tobacco in the built-in humidifier, it will be well to fit a rectangular sheet of thin asbestos to the roof of the cabinet. Although the asbestos is pliable and not difficult to fit, time may be saved by installing it before completing the cabinet.

How the parts are placed. The loudspeaker is a midget dynamic unit

The top compartment can be used for cigarettes or your pipe tobacco

## WHAT YOU WILL NEED

Two-gang tuning condenser, .00036 mfd.  
Antenna coil.  
Radio-frequency coil.  
Midget volume control, 20,000 ohms.  
Dual electrolytic condenser, 8 and 16 mfd.  
Dual electrolytic condenser, 5 and 5 mfd.  
Tubular electrolytic condenser, 12 mfd.  
Dual tubular condenser, .1 and .1 mfd.

Two tubular condensers, .01 mfd.  
Fixed mica condenser, .0003 mfd.  
Fixed mica condenser, .001 mfd.  
Fixed tubular condenser, .1 mfd.  
Fixed resistor, 300 ohms, 1/2 watt.  
Fixed resistor, 30,000 ohms, 1/2 watt.  
Fixed resistor, 2 megohms, 1/2 watt.  
Fixed resistor, 400,000 ohms, 1/2 watt.  
Fixed resistor, 500,000 ohms, 1/2 watt.  
Fixed resistor, 600 ohms, 1/2 watt.  
Fixed resistor, 5,000 ohms, 1 watt.  
Line cord and resistor, 185 ohms.

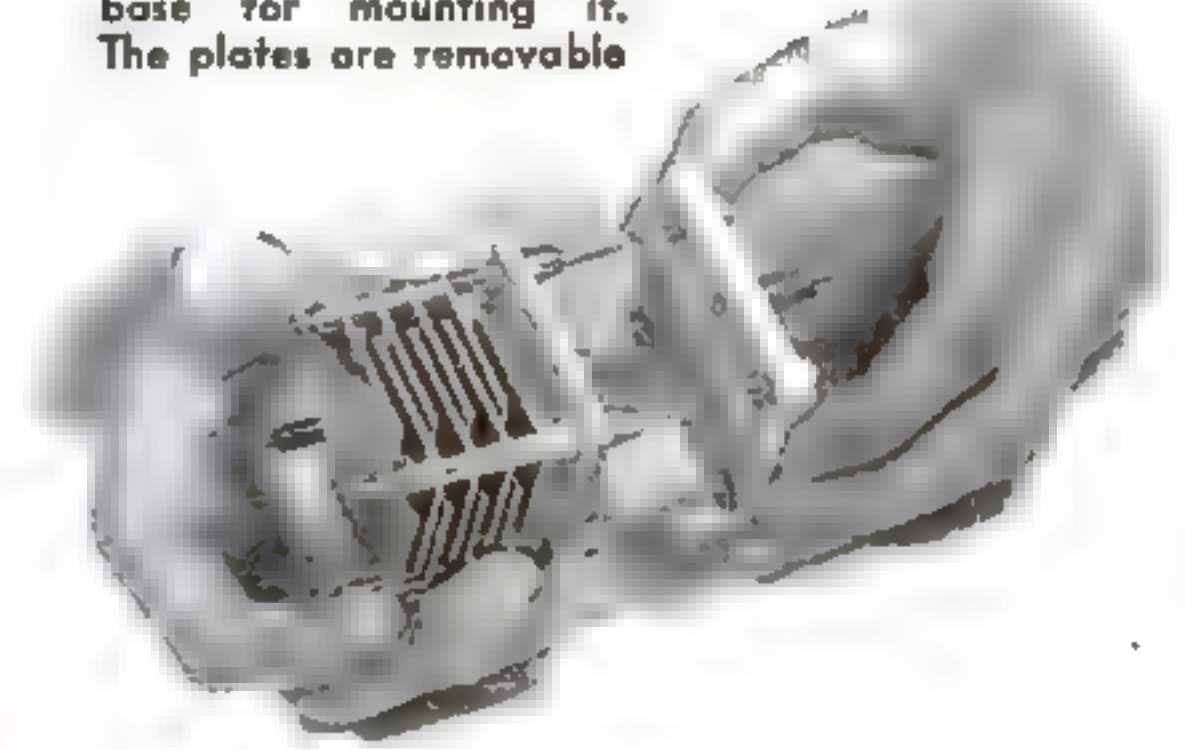
*Miscellaneous.*—Aluminum chassis, cabinet, midget tubes (four), special thin sockets, loudspeaker, output transformer, knobs, etc.



# A Page of New Radio Ideas



Plug-in air condenser and base for mounting it. The plates are removable

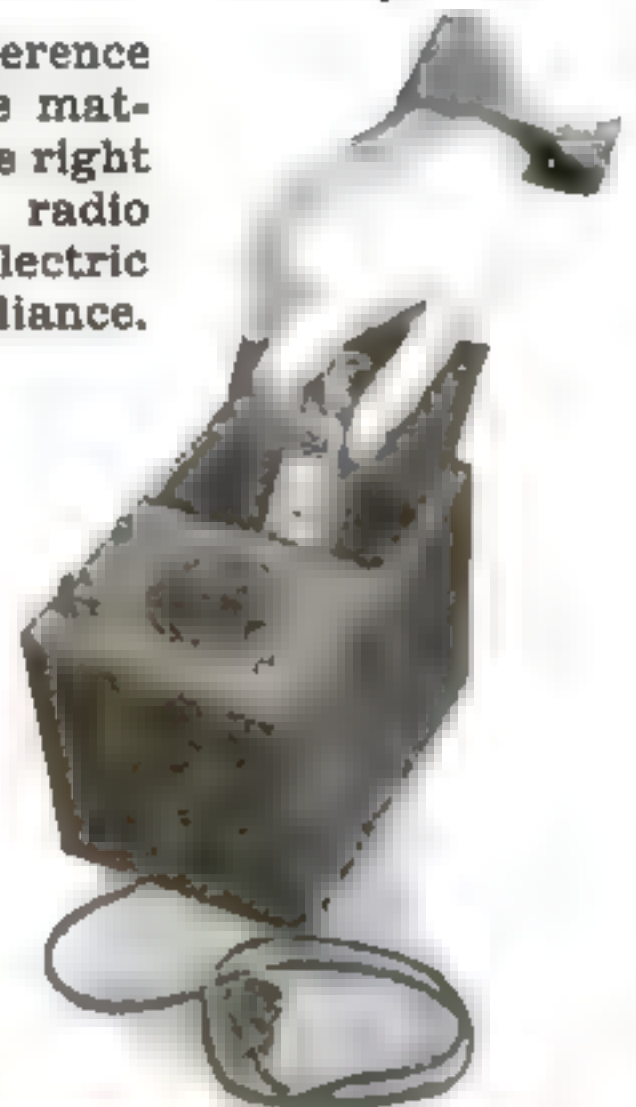


## Fixed Condenser Plugs In

FIXED air condensers, constructed along the lines of plug-in coils, are now available to radio amateurs. Just over two inches square, the plug-in condensers have plates that are readily removable, making it possible to increase or decrease their capacity.

## New Interference Analyzer

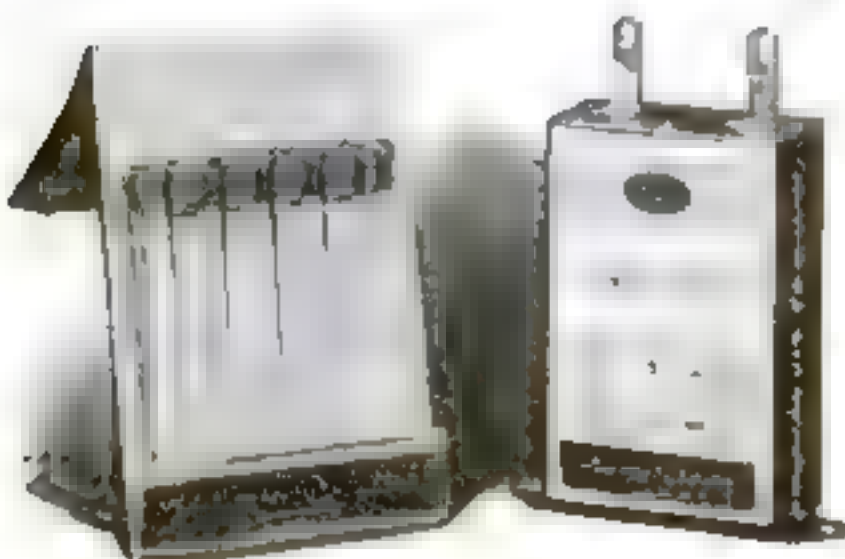
WITH a new interference analyzer, it is a simple matter to determine just the right condenser to silence radio noises caused by an electric motor or similar appliance. In use, the analyzer is plugged into the lighting circuit and the appliance is in turn plugged into it. When the control knob is adjusted to cut out the loud-speaker noises, a dial shows the capacity connected into the circuit and indicates the condenser that should be used.



Portable remote-control unit. By twirling the dial, a user can tune a receiver anywhere in the house, as illustrated above

RADIO receivers in one room of a home can be tuned from any other room with the use of a new portable remote-control unit that is not connected by even a single wire with the set itself. Essentially a compact, battery-operated short-wave transmitter, the control unit has a dial marked with the call letters of eight broadcasting stations. When the dial is twirled to a particular station, the unit sends out electrical impulses that operate relays in the main set to tune it to the desired station. The portable tuner will not control any other set than the one to which it is adjusted.

## Filter Condenser Is Matchbook Size



AMONG the miniature radio parts now available to the builders of compact radio receivers and transmitters is the midget filter condenser shown at the left. Little larger than a book of matches, the tiny unit is available in a complete range of capacities.

## Holder Dispenses Record Needles

NEEDLES for use in phonographs or radio record-player attachments are automatically dispensed by a novel device just marketed. When a user presses down on the top of the cup-shaped dispenser, a new needle rises through a central slot, where it is easily grasped between the fingers.



Needle comes up through slot when holder top is pressed



## Magnets Form Odd Rack for Tools

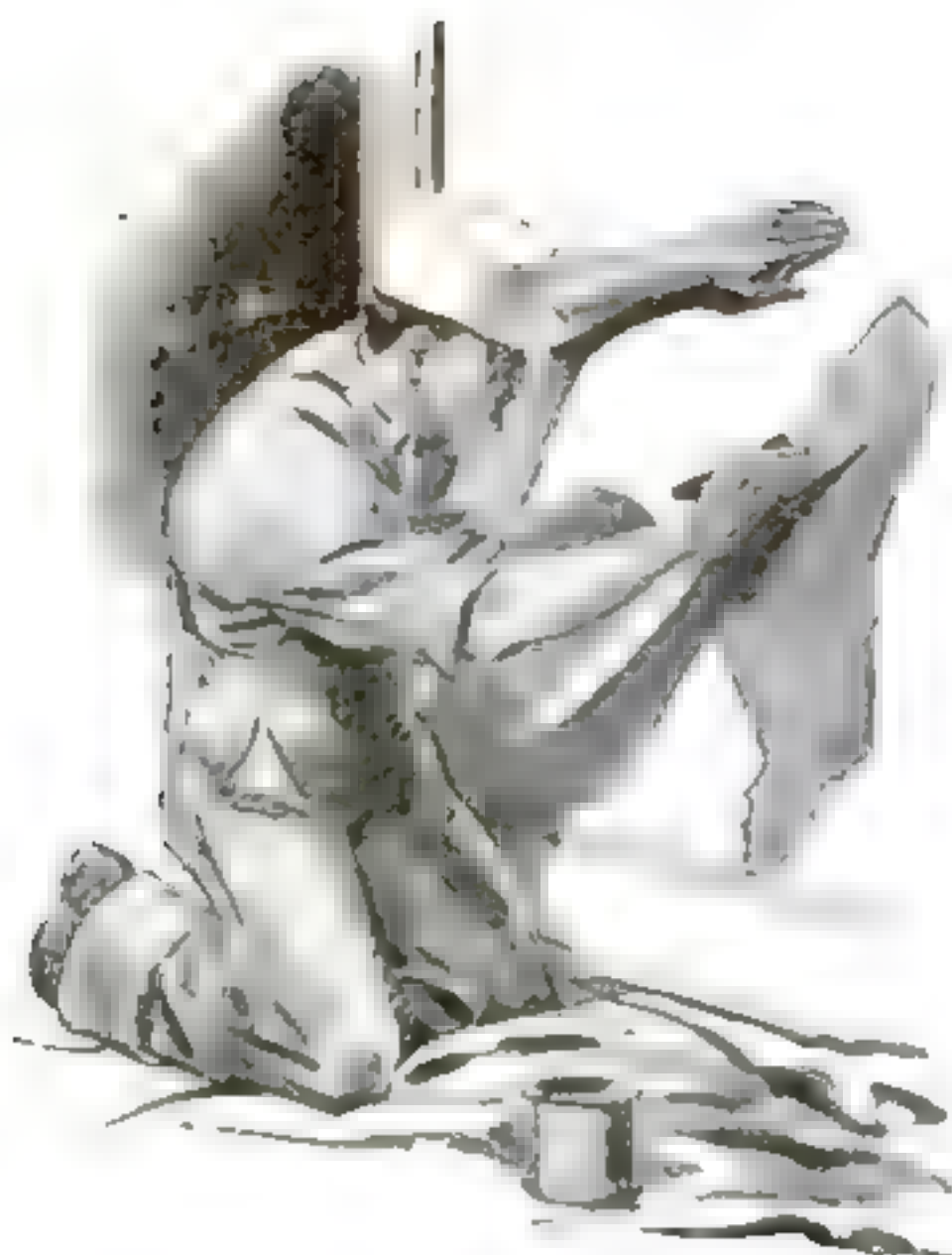
LARGE horseshoe magnets salvaged from junk heaps are used by a Salem, N. J., radio repairman as a novel rack for holding screw drivers, pliers, and other tools neatly in place on his workbench. Mounted side by side on a board, the magnets are tilted at an angle to allow easy access to the tools, as shown in the photograph above.



# Hints on Painting

Peeling and scaling . . . How to neutralize plaster patches . . . Removing old finishes from walls . . . Cold-water paints . . . Enameling garden furniture

By RALPH G. WARING



**P**AINTING problems frequently arise to perplex the handy man and professional painter alike. Here are some questions of general interest recently received from readers, together with answers by one of the country's outstanding experts on painting and finishing.

**Q** Paint on the wood trim of our brick house began to peel and scale after only a year. The painter did the painting on the south side during a light rain, but claimed this made no difference so long as the surface was not moistened. I inclose photos and paint scale.

**A** While I should not permit painting during a shower even on protected surfaces, the failure in this case was not due to moisture but to a great amount of soot or dirt, apparently from soft coal smoke, which practically destroyed adhesion. This was revealed by microscopic examination. Why property owners will put good paint over dirty surfaces is something I shall never comprehend. It will be necessary to burn off this trim, prime, dry hard, and give two coats of finish paint for a good job.

**Q** Newly plastered patches on several walls were allowed two weeks to dry by furnace heat, then sealed with one coat of half orange and half white shellac, dried for days, and coated with high-grade flat wall paint. Two months later all the spots showed through. Even recoating with wall paint does not hold them back.

**A** The new or "hot" plaster should have been neutralized with a solution of 3 lb. zinc sulphate to 1 gal. hot water, brushed on freely over the hardened patches and allowed to dry overnight. A second error was in the use of any orange shellac. White alone was sufficient. Shellac for sealing purposes should be "cut" or thinned with three or four parts of denatured alcohol. Only a trace of shine should appear after the shellac has dried. The most modern practice is to use, instead of shellac, a wall primer made by a nationally known lead manufacturer—a product that is practically trouble proof.

**Q** Please tell me how to remove old paint from a plastered wall on which some of the original paint sticks hard while the rest peels off in patches.

**A** The first method, which must, however, be avoided if a stove or furnace is burning adjacent to or beneath the room being treated, is as follows: Protect floor with heavy building paper. Brush on standard type varnish remover heavily in single strokes, and avoid brushing back and forth. As soon as paint has softened, use a wide painter's scraper to lift it off. Wipe knife on squares of newspaper and burn them when done. Recoat and soften where necessary. Wash entire wall with burlap and denatured alcohol. Do not use benzine as frequently recommended on the remover can. Let wall dry overnight before painting.

The second method uses a caustic, so rub the hands and wrists with petroleum jelly and put on rubber gloves. Make a boiled starch solution as for clothes, but twice as strong. Add 1 lb. of commercial lye (such as is usually sold in grocery stores) for each gallon of starch and stir well until dissolved. Apply to wall with a palmetto fiber brush or whisk broom, starting at the top. Leave until coating has softened; then remove with scraper and wipe on paper squares. Wash wall with scrub brush and hot water, and wipe dry. Apply strong, undiluted vinegar generously with a wall brush. Let dry thoroughly before proceeding to paint.

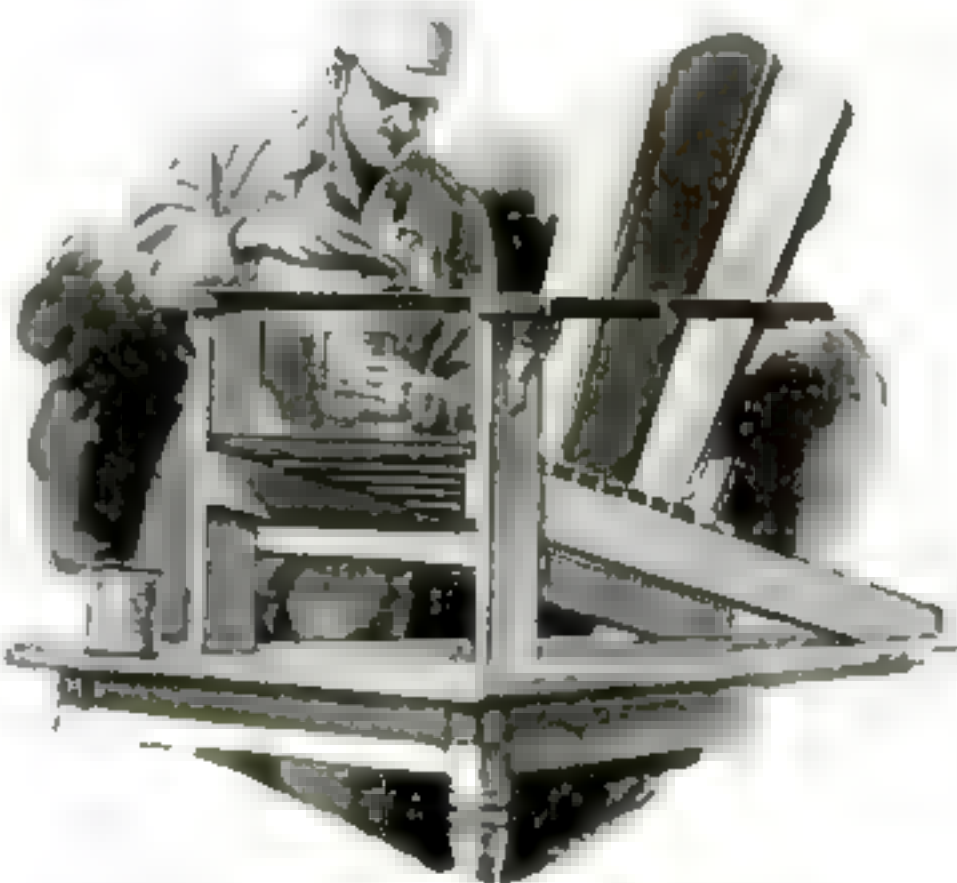
**Q** Will you please give your opinion of modern cold-water paints? I am referring to the newer water-resistant and washable types.

**A** They are inexpensive, easily prepared for use, and do not require a high degree of brushing skill to apply. The coverage is good, and the paint dries to a soft, even-textured

surface. It can be removed and re-coated readily. Their use should be confined to smooth, hard-finished walls.

**Q** A couple of weeks ago I painted a pine Cape Cod lawn chair. The paint doesn't rub off, but feels sticky when the chair is used. I shellacked it and then gave it a coat of white lead, linseed oil, turps, and drier.

**A** Shellac should never be used on furniture or woodwork exposed to the weather. You should have used varnish reduced from one third to one half with pure turpentine. The second mistake was in the use of outside house



Painted porch or garden furniture should be finished with a good outside enamel

paint. Use a good four-hour, *outside* enamel and apply two coats or more.

**Q** What is the best method of removing oil paint from a brick building so that stucco can be applied? The paint has been on for a number of years.

**A** The only possible method is to use the sand blast. Any remover applied in liquid form might cause serious difficulty later on.

**Q** How can I remove stubborn discolorations from wood which are not affected by the bleaching agent I ordinarily use (12 oz. oxalic acid to 1 gal. water)?

**A** Try an application of chloride-of-lime paste, well thinned with water. Clean it off when almost dry and follow with a solution of sodium carbonate in the proportions of 1 lb. to 1 gal. hot water. Then, if the stain persists, use a solution of sodium hyposulphite, 2 lb. to 1 gal. of water. When almost dry, a final coat of oxalic acid, 2 lb. to 1 gal. hot water, should be applied. The surface should then be neutralized with a borax solution.



When softened, the paint is lifted off with a scraper and wiped on squares of paper



This improvised tripod gives firm support for a moderate-sized camera



# Tiny Table-Top Tripod

## HAS PENCILS FOR LEGS

A TABLE tripod for a miniature camera can be made in five minutes time from three lead pencils, a disk of hardwood or composition about  $\frac{3}{4}$  in. thick and  $1\frac{1}{2}$  in. in diameter, and a  $\frac{1}{4}$ -in. roundhead stove bolt 1 in. long. Drill a hole through the center of the disk to take the bolt snugly, and

drill three more holes not quite through to hold the pencils, which serve as the legs. The holes for the pencils must be drilled at a slight angle to give sufficient spread to the legs. The eraser ends of the pencils prevent the tripod from slipping or marring the table top. The parts for the tripod may be carried in the pocket, ready to be assembled at a moment's notice.—K. M. S.



The parts of the table-top tripod, shown at left, can be slipped in one's pocket

Below, figures from an old calendar are stuck on the film holders to identify them readily in dim light

## Photo Lamps Hang from Picture Molding

FOR lighting portraits, home movies, and indoor color shots, it is often difficult to support the lamps at a sufficient height unless high floor stands are available. If there is a picture molding around the room, it is a simple matter, however, to make a support that can be suspended from it in any position desired.

A stick about  $\frac{1}{2}$  by  $1\frac{1}{2}$  in. by  $3\frac{1}{2}$  ft. is slotted down the center to within  $1\frac{1}{2}$  in. of each end, and a picture hook, with one branch of its "S" cut off, is bolted to one end of the stick. A cross-piece of the same material is attached to the slotted piece with a bolt and wing nut so that it can be adjusted up and down. Inexpensive clamp-on reflectors are fastened to the cross arm, and the long stick is hooked over the picture molding.



## Film Holders Numbered with Cut-out Figures

DIFFICULTY in identifying particular film holders in the darkroom may be overcome by attaching to each one a legible black-on-white figure cut from an old calendar. Protect the numbers with thin varnish or by covering them with a slightly larger piece of clear cellulose material.—E. A. B.

## Shielding Red Window in Roll-Film Camera

THE adhesive strip supplied with panchromatic roll film for covering the red window in the back of old-style cameras sometimes sticks to the transparent disk and pulls it loose. A more convenient way to shield the window is to make a springy brass clip as shown and cement a piece of black felt or velvet to the part used for covering the window. It is kept in place except when the film is being wound.—W. C. W.



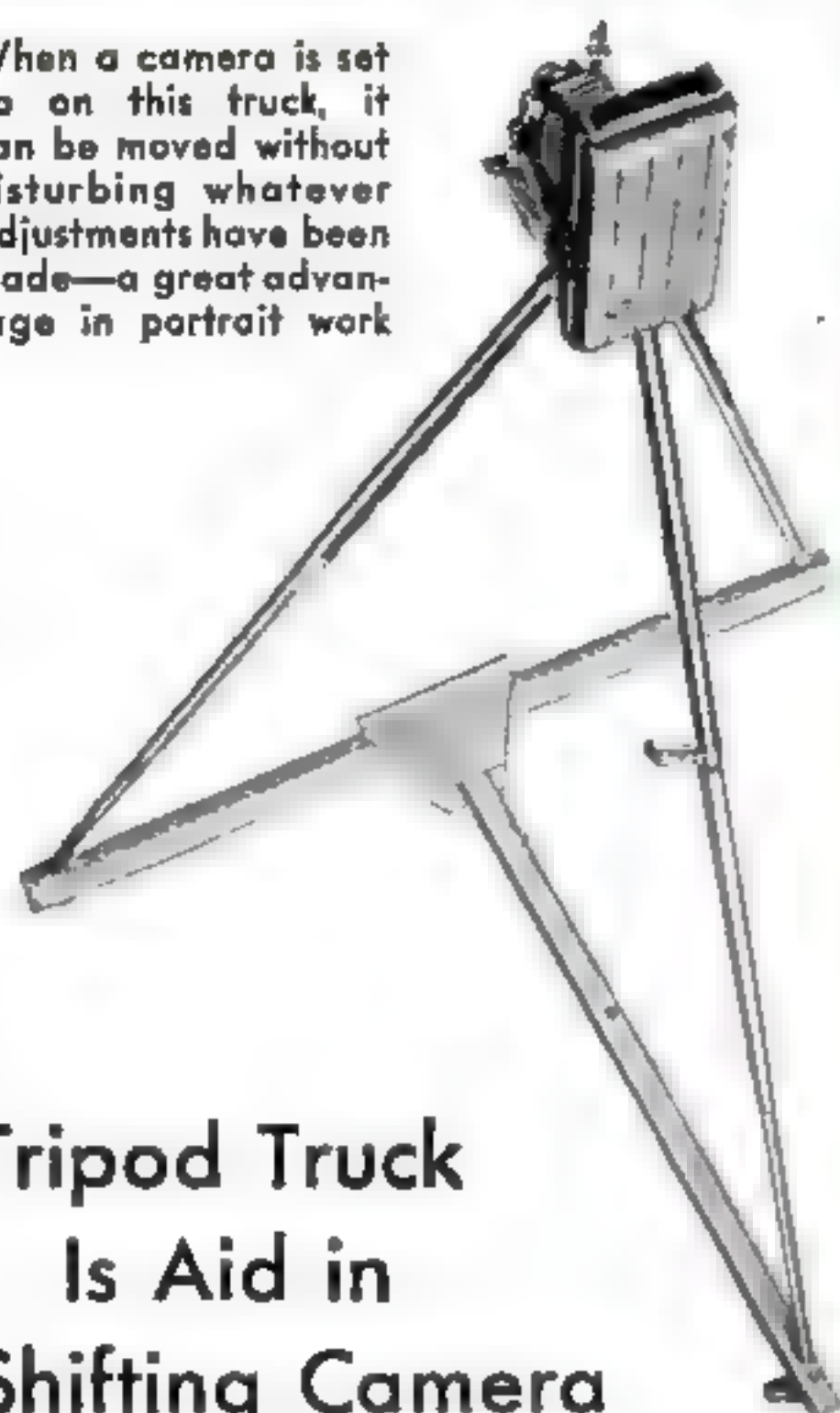
## Rubber Glove Filled with Ice Cools Developing Solution



HOT weather always brings with it the problem of cooling photographic developing and fixing solutions. Although many amateurs put cracked ice in the solutions, this method has its disadvantages, because the melting ice causes a certain amount of dilution. A better way is to fill a rubber glove with cracked ice, immerse it in the developer, and agitate the solution until the proper temperature is obtained. To provide a maximum area of cooling surface and bring quicker results, pack the fingers of the glove tightly with the ice.—R. M. ADAMS, JR.



When a camera is set up on this truck, it can be moved without disturbing whatever adjustments have been made—a great advantage in portrait work



## Tripod Truck Is Aid in Shifting Camera

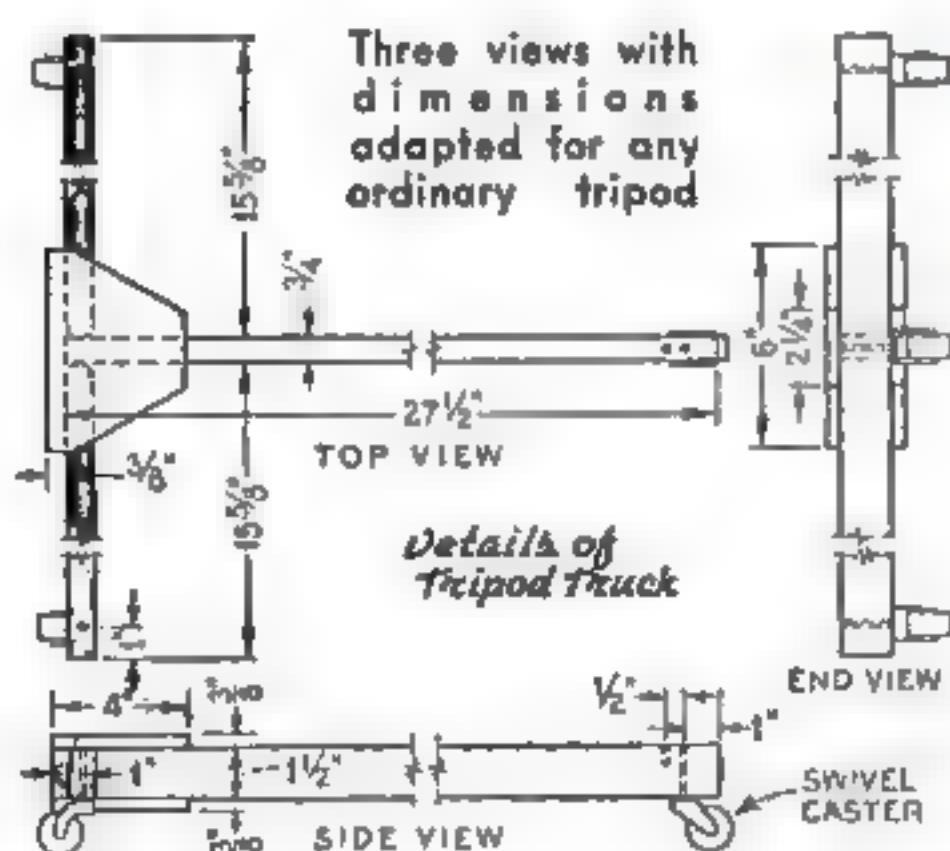
PROBABLY every amateur photographer has wished that he might move his camera and tripod a few inches without disturbing the entire set-up, especially when taking portraits. This problem may be solved, at least for indoor work, by making a folding tripod truck like that illustrated.

The dimensions give a 30-in. spread for the tripod feet, but need not be followed exactly. I use a swivel caster in the rear only as I find that gives better control. The others are fixed. If desired, wooden cams may be added to enable the truck to be lifted slightly off the casters for locking it in any given position.



The tripod truck partly folded up

—JOHN M. AVERY.



## Improving a Dull Razor Blade

INSTEAD of honing a safety-razor blade when it begins to pull, I merely turn it over and replace it in the holder. This seems to make it cut better and last longer before being discarded or resharpened.—D. W. C.

AGAIN

# CHAMPIONS

## PROVE THEMSELVES

# THE BETTER SPARK PLUGS



## 15<sup>TH</sup> CONSECUTIVE VICTORY AT INDIANAPOLIS

500 Mile Race—Clean Sweep of First 10 Places—New Track Record of 117.2 m.p.h.—One More Dramatic Page to Champion's Unequaled History of Proved Better Performance in Every Engine.

This latest major achievement dramatically demonstrates to you and to motorists everywhere that every engine yields better performance when equipped with Champion Spark Plugs.

The Indianapolis 500 Mile Race is one of the toughest tests of men, engines and equipment known to the motoring world. When one spark plug consistently, year after year for 15 consecutive years, is used by every winner and in the vast majority of all cars to finish, it must have out-

standing performance and dependability.

Nothing short of Champion's unequalled research, engineering and manufacturing facilities could possibly produce spark plugs with the better performance and dependability for which Champions' reputation is world-wide. In twenty-seven years every facility and every resource of the company has been devoted exclusively to this one product and the one end—better performance with Champions.

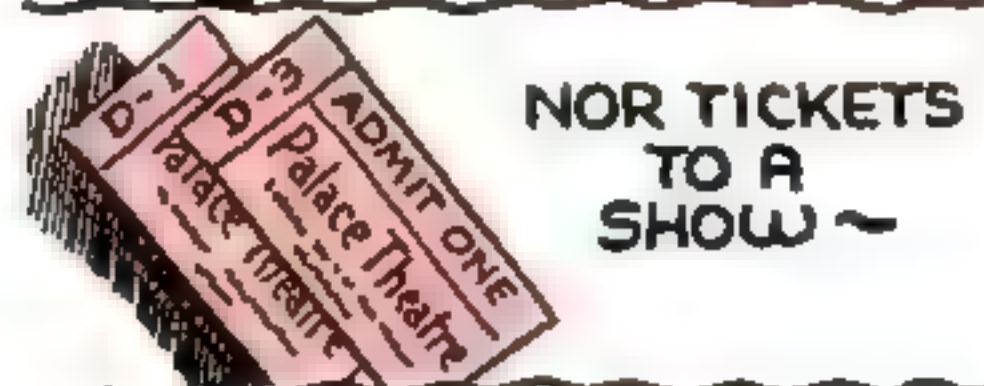
Floyd Roberts, the winner of the 1938 Indianapolis 500 Mile Race, added a stirring chapter to Champion's history of racing achievements. His average of 117.2 m.p.h. is a new record. The first 10 cars to finish, in which not one spark plug was changed throughout the race, were all Champion equipped:

CHECK AND CLEAN SPARK PLUGS WHEN YOU CHANGE OIL

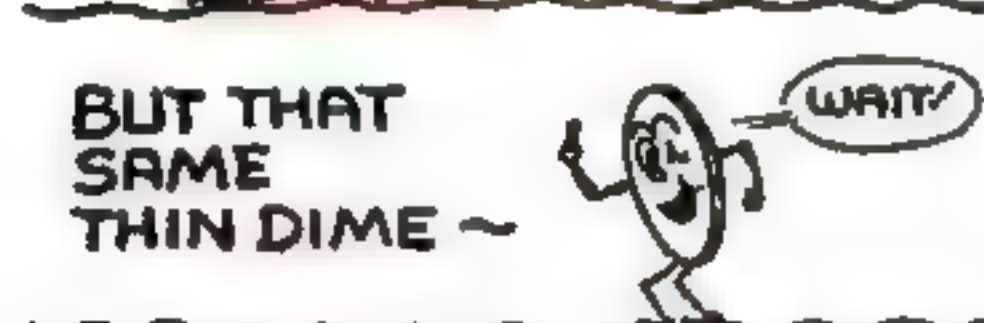


# Treet Topics

IT CAN'T BUY FLOWERS ~



NOR TICKETS TO A SHOW ~



WILL TAKE YOU A LONG WAY ON A DATE



IF YOU DO THIS ~



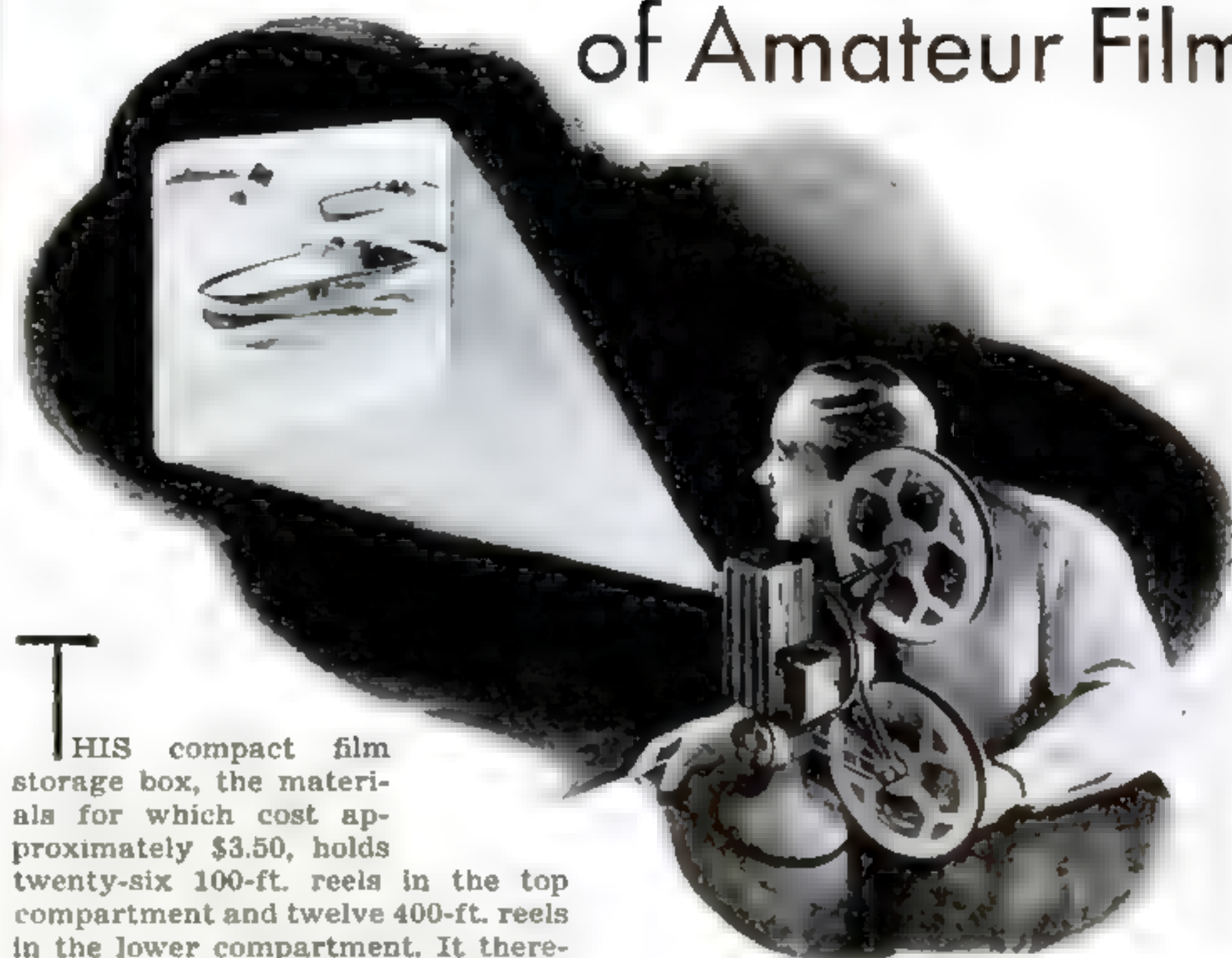
-AND TREET YOURSELF TO A PACK OF PERFECT SHAVES!



FOR GEM AND EVER-READY RAZORS

Treet Safety Razor Corporation, Newark, New Jersey

# Storage Box Holds 7,400 Feet of Amateur Film



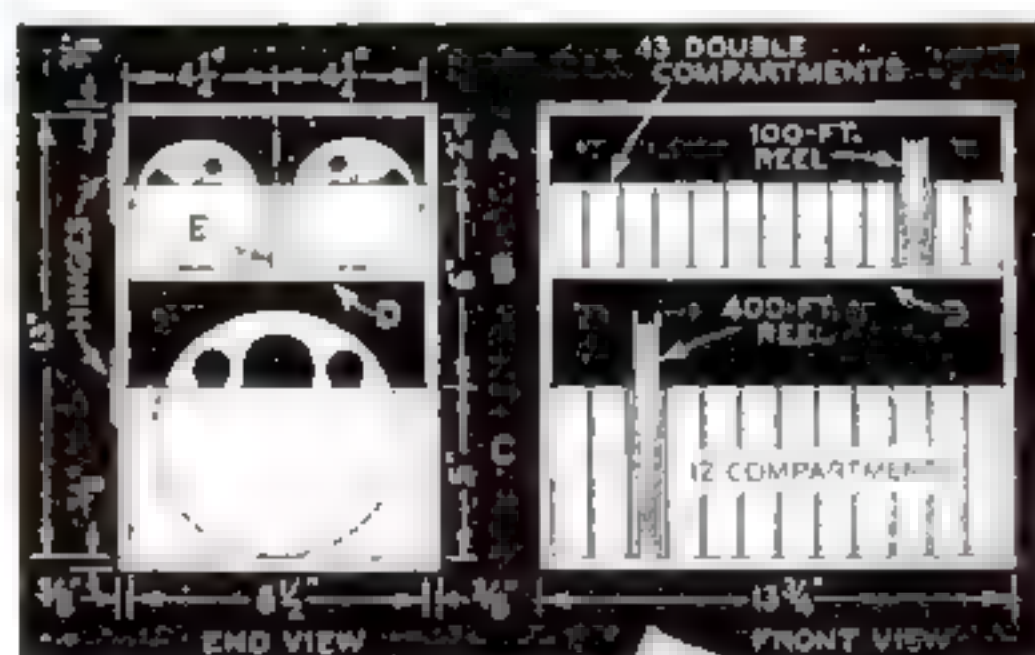
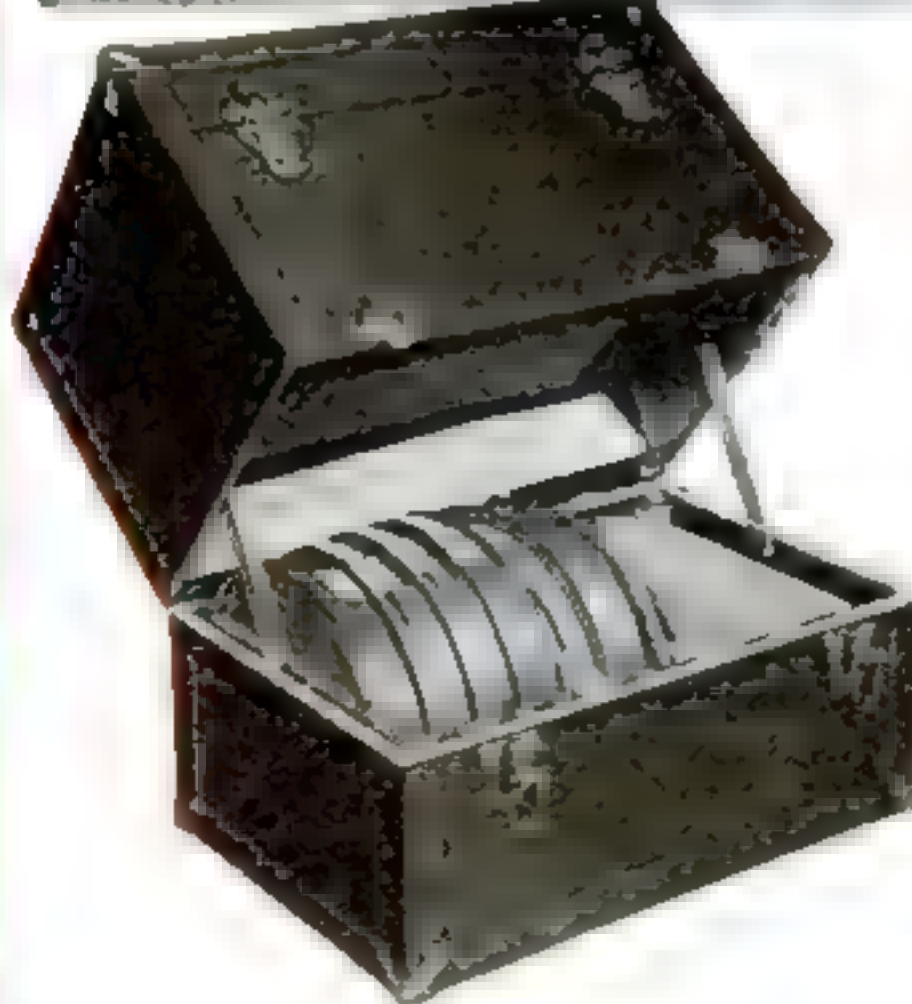
THIS compact film storage box, the materials for which cost approximately \$3.50, holds twenty-six 100-ft. reels in the top compartment and twelve 400-ft. reels in the lower compartment. It therefore has a total capacity of 7,400 ft. of 16-mm. film!

Cut two  $\frac{3}{8}$ -in. plywood panels exactly 13 by 8 $\frac{1}{2}$  in. for the ends, and

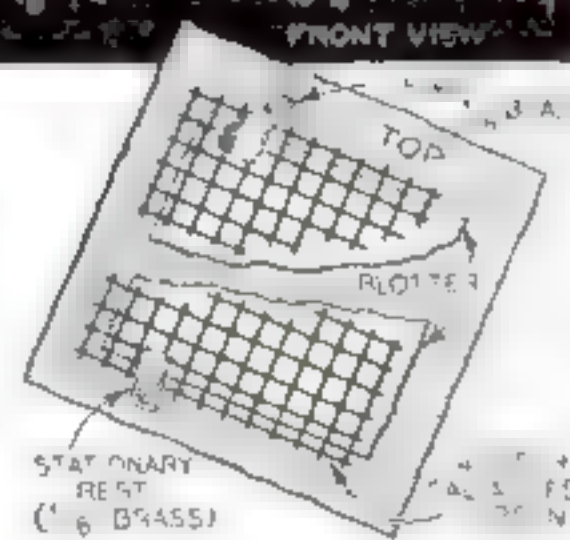
two 13 by 13 $\frac{1}{4}$  in. for front and back. Then divide each into three sections A, B, and C, as shown. On sections B and C of the front and back, lay out the divisions and groove with a saw just deep enough to hold the galvanized-iron partitions in place. Note that the spaces for the 400-ft. reels are slightly wider than for the 100-ft. reels. Of course, you may divide the space to suit your own requirements.

Assemble the three box sections with nails. Then cut piece D from  $\frac{3}{8}$ -in. plywood to fit in box section B and nail it 2 $\frac{1}{2}$  in. from the top to serve as the bottom of the top film compartment. Use another piece 2 $\frac{1}{2}$  in. wide for vertical partition E, groove it on both sides, and nail it in place. Next cut and nail on the top and bottom of boxes A and C.

The corners are reinforced with a thin grade of galvanized iron strips 2 in. wide, bent to form angles. Punch holes in



How the box is constructed and a detail of the humidifying blotter and screen. Left, two views of the container







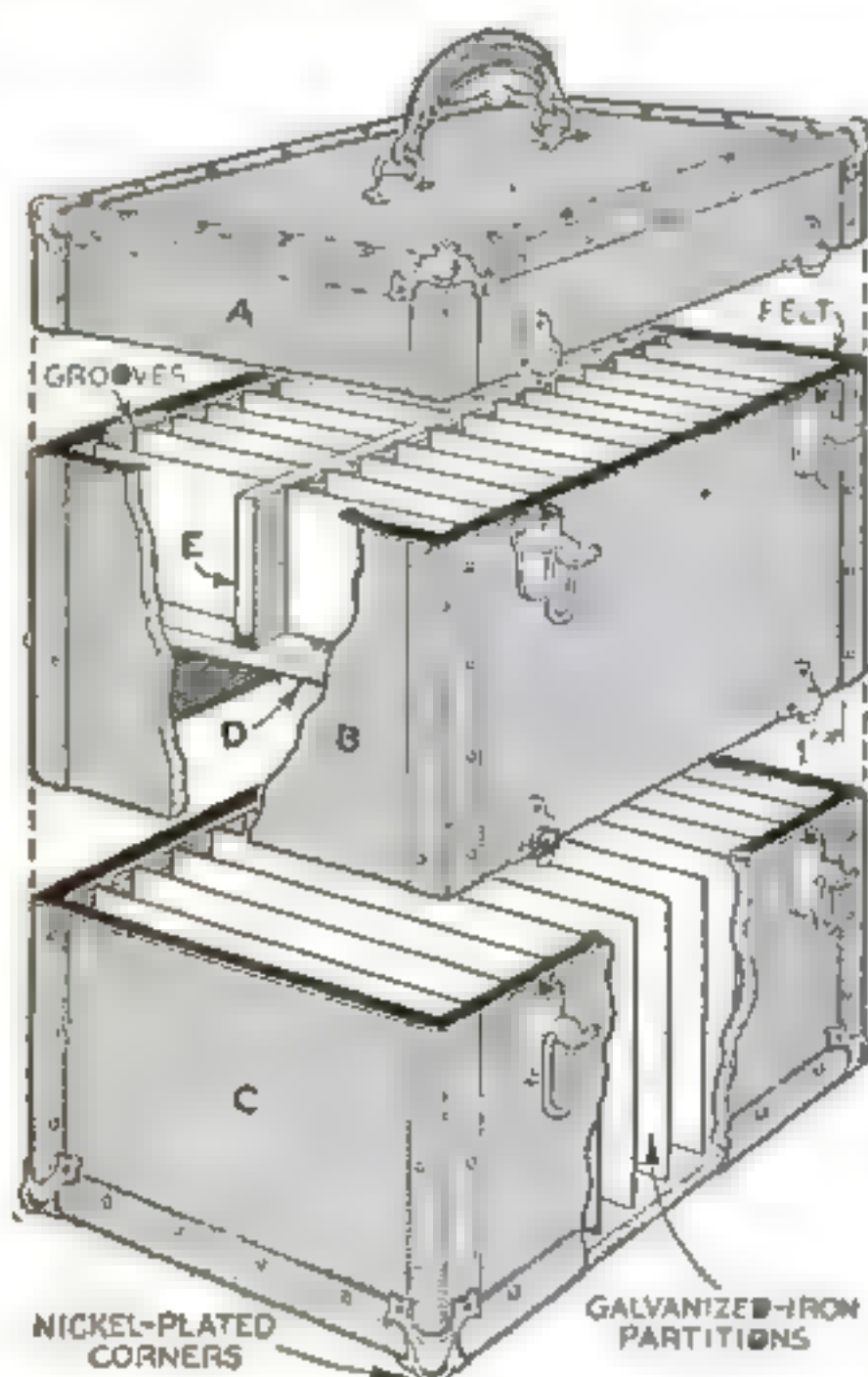
Top compartment open, showing screen, index, and numbered spaces to hold reels

both edges about 2 in. apart and fasten with small round-head screws. Cut the partitions also from galvanized iron.

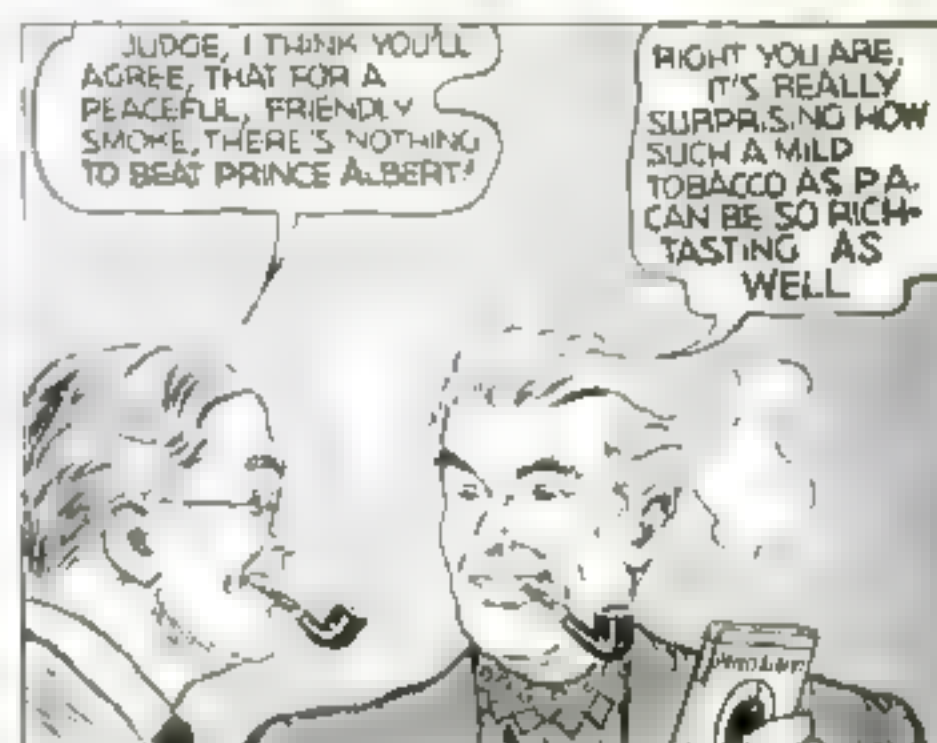
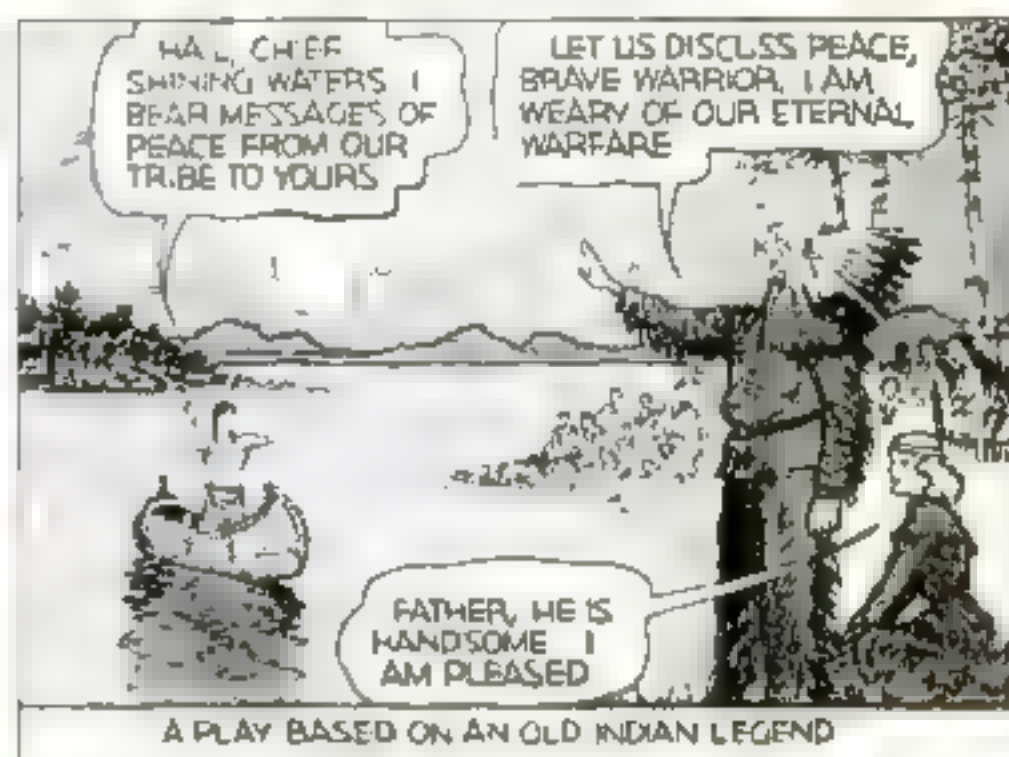
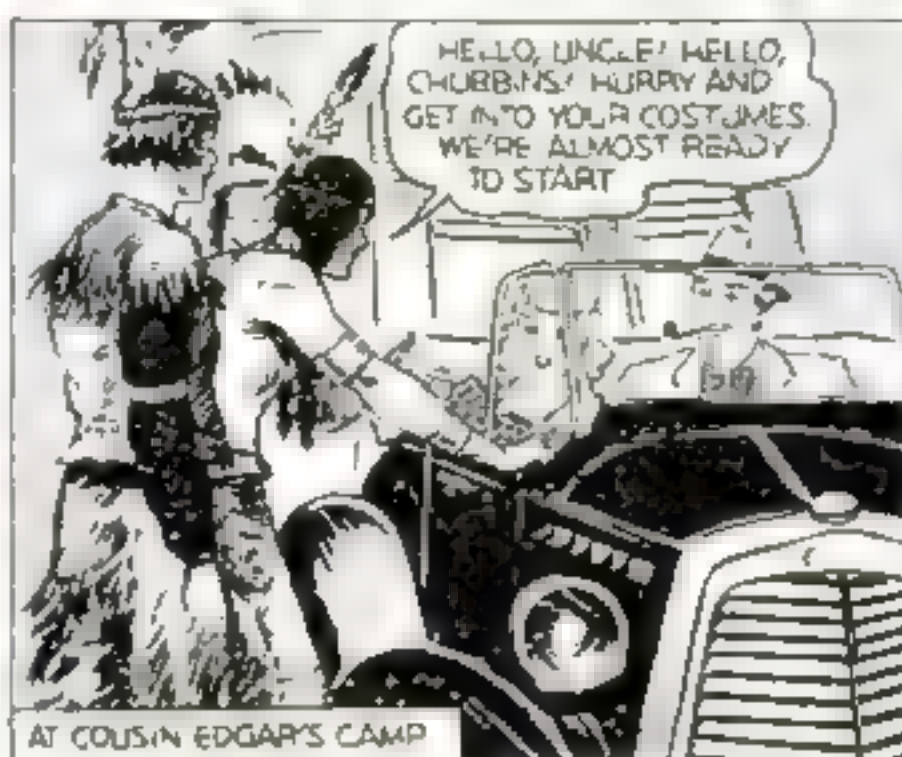
It is best to paint the units before assembling them or applying the hardware. I used two coats of black four-hour enamel on the exterior, and dark mahogany stain followed by two coats of varnish on the interior.

Tack a narrow strip of felt all around the top edges of the center and bottom boxes to provide better insulation. Then assemble the case with the hardware.

A blotter held in place under each lid with  $\frac{1}{4}$ -in. mesh galvanized screen as shown provides the necessary humidity when moistened with a mixture of ten parts water and one part glycerin. A card index is provided by cutting stiff white card to fit the back panel of each compartment lid. List each film by title on the index card, number the reels accordingly, and place them in their corresponding compartments, which may be identified with numbers applied on bits of adhesive tape.—MANUEL M. MORENO.



A separated and partly broken-away drawing to make clear the entire construction



**"AND IN THIS CORNER....  
THE WORLD'S CHAMPION PIPE TOBACCO"  
(UNBEATEN, TOO, FOR "MAKIN'S" CIGARETTES)**



**BETTER SMOKES—OR YOU DON'T PAY!**

Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the pocket tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage.

(Signed) R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

Copyright, 1938, R. J. Reynolds Tobacco Company

**50** pipefuls of fragrant tobacco in every 2-oz. tin of Prince Albert

**PRINCE ALBERT**

**THE NATIONAL  
JOY SMOKE**



## GOOD NEWS FOR CAR POLISHERS



**THIS IMPROVED  
DU PONT POLISH**



**SAVES YOU WORK**

Now it's easier than ever to keep your car looking its best. For your old friend, No. 7 Polish, is now made even better! It's speedier. Loosens dirt and Traffic Film faster than ever. And what a shine this No. 7 leaves! Try it on your car today.

**SAMPLE FOR YOU.** Send 6c for postage, and get a sample can of No. 7 Duco Polish, enough for fenders and hood. (Offer good in U. S. only.) Write Du Pont, Dept. PS-4, Wilmington, Delaware.

**And here's the new easy way to wax your car!**

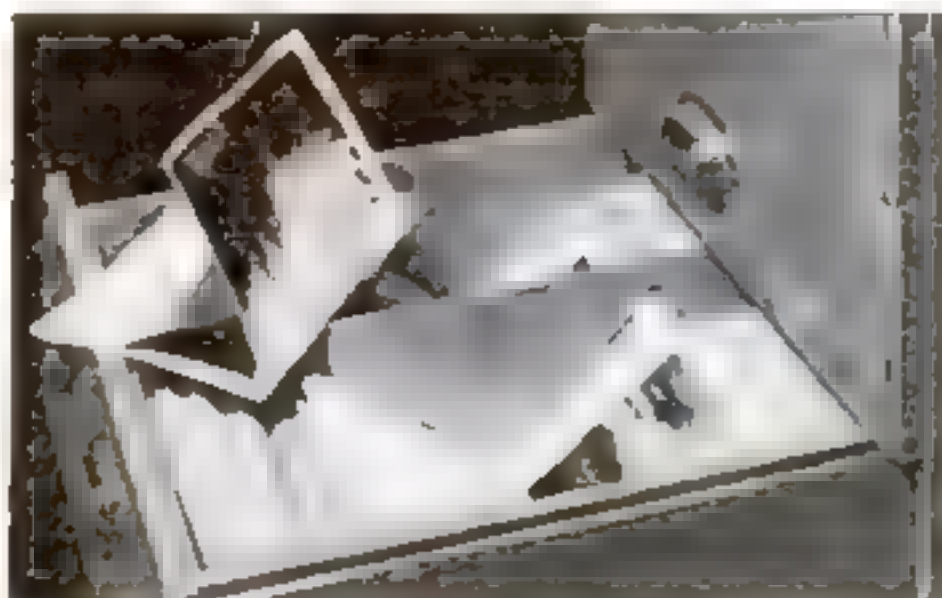


• Use Du Pont's new liquid Speedy Wax. It cleans as it waxes. Does the job in half the time. Try it!



*Always ask for*  
**DU PONT POLISH**

## Protecting and Filing Photo Negatives



**P**HOTOGRAPHIC negatives are conveniently filed in folders made from typewriter paper as illustrated. One end of the paper is folded over about  $\frac{1}{2}$  in. from the top so that a print of the negative may be pasted to the flap thus formed. The paper should be 1 or  $1\frac{1}{2}$  in. wider than the negative to protect it and so filing records may be written on the flap at the end of the print. No separate print file is then necessary. When additional prints are required from a negative, the entire folder is taken into the darkroom.

## Radio Parts Save Expense in Model-Railway Work

RADIO parts often can be put to good use by the model-railroad enthusiast at a distinct saving in cost over standard equipment.

Radio bus-bar wire, either round or square, makes serviceable third rail. Being tin-coated copper, it does not corrode and is an excellent conductor of electricity.

Small push buttons and toggle switches, which range from the simple on-and-off type to the double-pole, double-throw switch with center position off, are handy on a control panel. L-shaped radio terminal lugs can be used as switch levers for manual control of switches by use of cable. In radio use these are known as "right-angle terminal lugs." The center hole at the elbow is too large to pivot on a small screw, but this can be remedied by soldering on a small washer. Radio phone tips and jacks make good plug-in connectors for signals and lights.

Radio transformers of certain types are useful for lighting circuits, but do not try to use them for the actual operation of locomotives as they will not stand overloads. Radio pilot lights for lighting buildings are better than flashlight bulbs because they last longer.

Fuse blocks inserted between the road and the rheostat may save your rheostat from burning out in the event of a short circuit. Large capacity rheostats are also available. A good general-purpose one that is not likely to burn out is a 2.5-ampere type of 50- to 80-ohm capacity.

While you are in the radio store, don't overlook binding posts, wire of suitable sizes, and pilot-light sockets for installation in cars, buildings, signals, and headlights.—C. A. VOELCKEL



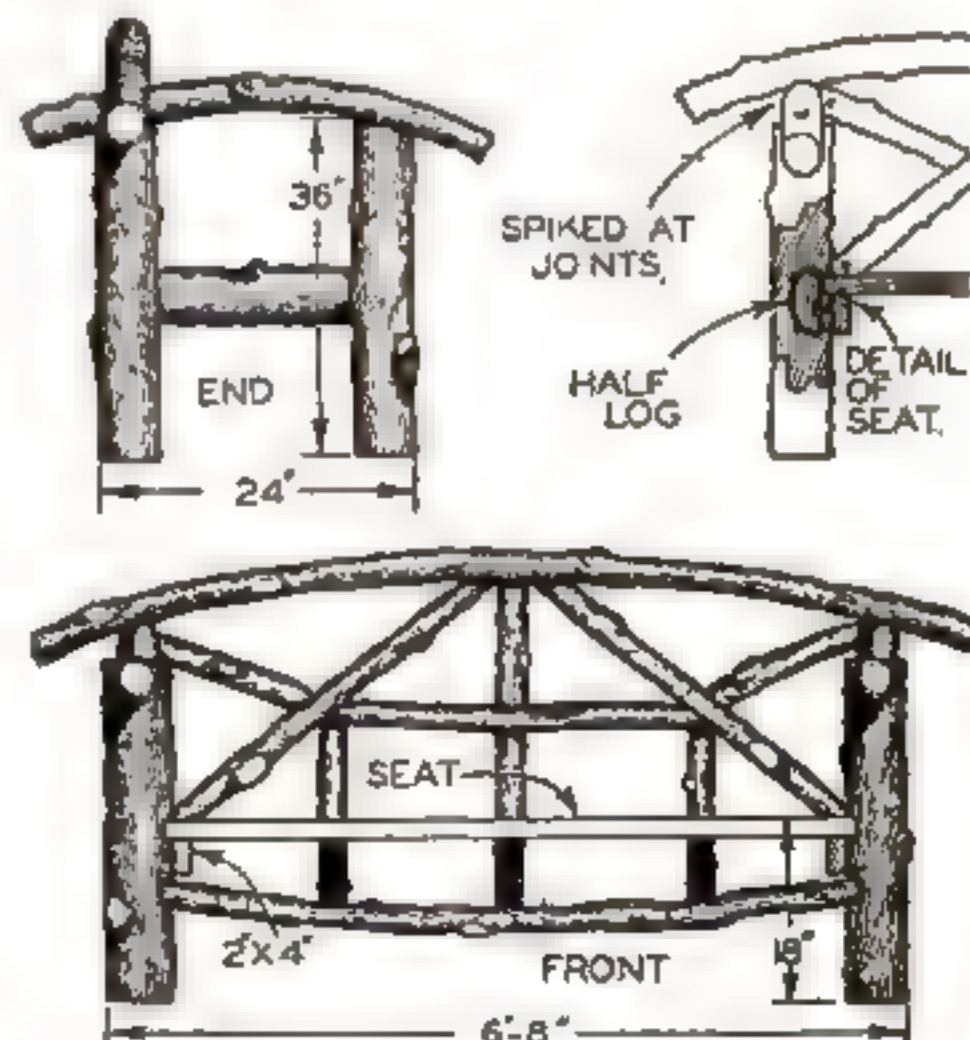
## Graceful Rustic Bench for Lawn or Garden

ALMOST any kind of logs can be used to build this substantial rustic bench for the lawn. The corner posts are 36 in. high and about 5 in. in diameter. The rest of the logs are smaller—about 3 in. at the large end. The two lower rails are notched into the corner posts or legs as shown. The logwork at the back is marked and fitted one piece at a time.

All joints are spiked with care to prevent splitting. It is a good idea to drill holes wherever the spikes have to be placed close to the ends. At all major points twenty-penny spikes should be used, but sixteen-penny can be used at the smaller joints.

The seat is made of two planks 2 in. thick, 10 in. wide, and 6 ft. long. These are supported by a piece of "2 by 4" at each end, which is spiked to the legs. The seat planks are notched into the legs slightly, and the ends are capped over with a half log as shown in the seat detail. Half of the log is used at each end.

The seat, ends of all logs, and places where branches have been cut off may be painted some bright color. Orange, red, or light green are suitable colors to use.—H.J.



Curved logs are used for the main back rail and the arms to give the bench individuality

## Worn Balloon Bicycle Tire Reinforced with a Boot

WHEN a balloon tire on my son's bicycle wore badly in one spot, I cut a boot from another old casing and found that it fitted and remained in place better than a boot in a car tire. After a month's use, the tire is still giving good service.—TED JOHNSON.





SAYS:

**O**N COPPER or other tough materials, spiral-fluted taps produce more accurate threads and last longer between grinds than regular taps.

In a small machine shop, preference should be given to the lead bath for hardening arbors, mandrels, or any other tools where the length is excessive in proportion to the diameter.

An error in judgment in the shop is often costly. For instance, a brand-new multiboring tool was found to be cutting large due to misalignment in a radial drill. The foreman, without much thought, ordered it ground down to give the required size. The machine was overhauled the very next day, but the tool couldn't be, and it is probably in retirement for ever.

A bad start leads to a poor finish, so always grind the point of a combination center drill with care and use a fine-grain wheel. It pays to check the results with a magnifying glass.

The main spring from a discarded clock is a handy thing to have around the shop, because there is often need for a well-tempered flat spring.

For light or medium grinding operations, diamond-dressing tools of the elongated type are most economical. They require no resetting if carefully used.

When surface grinding is being done to close measurements on a magnetic chuck, a thin film of machine oil on the chuck will raise the work from 0.0001 to 0.0002 in.

No truer words were ever spoken, so far as the machine shop is concerned, than "the man who keeps watching the clock is always one of the hands!"

A new file is said to last considerably longer if chromium plated before being used, especially for work on mild steels, cast iron, or brass.

Drill bushings made from non-deforming steel can be machined to size, in and out, and will require but a light lapping operation if properly hardened. Eliminating the grinding operations brings the cost down to that of bushings made from a cheaper grade of steel, yet they last much longer.

Ten years ago a machinist who brought up the subject of climb milling would have been laughed at. Today it is just a modern method of milling, although it is nothing to try unless you know something about it.

To keep your machine in tiptop shape so it will turn out better work, make a habit when shutting down week ends to coat all polished surfaces with a mixture of heavy grease and gasoline.

## Protect Yourself and Your Pocketbook with **THIS**

## **NEW BATTERY** **THAT LASTS**

**68%**

**LONGER!**



Built as a result of a 9-year study of how people drive, and how their batteries perform under every possible condition, this Willard "H-R" does all the things you've always wanted a battery to do, and does them 68% longer than the average of over 100 other brands, including all the best known makes.

### **7 OUTSTANDING FEATURES OF THE WILLARD "H-R"**

- 1** Reserve Ampere Hour Capacity—longer life and plenty of power for radio or accessories; and greater protection in emergencies.
- 2** Plates expertly designed, formed and processed to insure top performance.
- 3** Extra power for Winter starting—and superior resistance to summer heat.
- 4** Delivers high voltage to starter—saves gasoline, and oil dilution because of quicker starts.
- 5** Handsome, new-style Hard-Rubber Container—tough and rugged.
- 6** Written guarantee and adjustment policy, backed up by 42,000 Willard Dealers from coast to coast.
- 7** Protected with the new-type Willard Thread Rubber Insulators.

It stands up under the strain of hard, fast driving—day after day—without flinching.

It carries the extra load of radio, heater, cigar lighter and other current consuming devices without losing its punch.

It gives you maximum protection against failures in vital emergencies.

It is capable of standing more abuse—more heat—more jolting and more overcharging than an ordinary battery.

AND it will crank your motor to a fast start—time and time again—regardless of the weather.

For this new "H-R", Willard engineers have developed a new type of Thread Rubber Insulator which is inserted between the plates. A combination of latex and cotton threads, these new Willard Insulators are porous enough to permit fast chemical action yet tough enough to outwear the plates. In combination with the specially selected materials, and the exclusive features Willard builds into this battery—these Thread Rubber Insulators give the "H-R" its amazingly long life.

If your car is one—two—or three years old, the slight difference between the purchase price of an "H-R" and an ordinary battery is the *biggest bargain* on the market for you. This small expenditure is sure protection against a larger one later on.

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# UNRULY HAIR

*Stays Neatly Combed*



**Even Stubborn Hair Will Stay In Place**



**Costs But A Few Cents To Use**  
— a bottle lasts for months

**IS YOUR HAIR** difficult to keep in place? Does it lack natural gloss and lustre? It is very easy to give it that rich, glossy and orderly appearance so essential to well-groomed boys.

Just rub a little Glostora through your hair once or twice a week — or after shampooing, and your hair will then stay, each day, just as you comb it.

Glostora gives hair that natural, rich, well-groomed effect, instead of leaving it stiff and artificial looking as waxy pastes and creams do.

Try it! A large bottle of Glostora costs but a trifle at any drug store.



**Glostora**



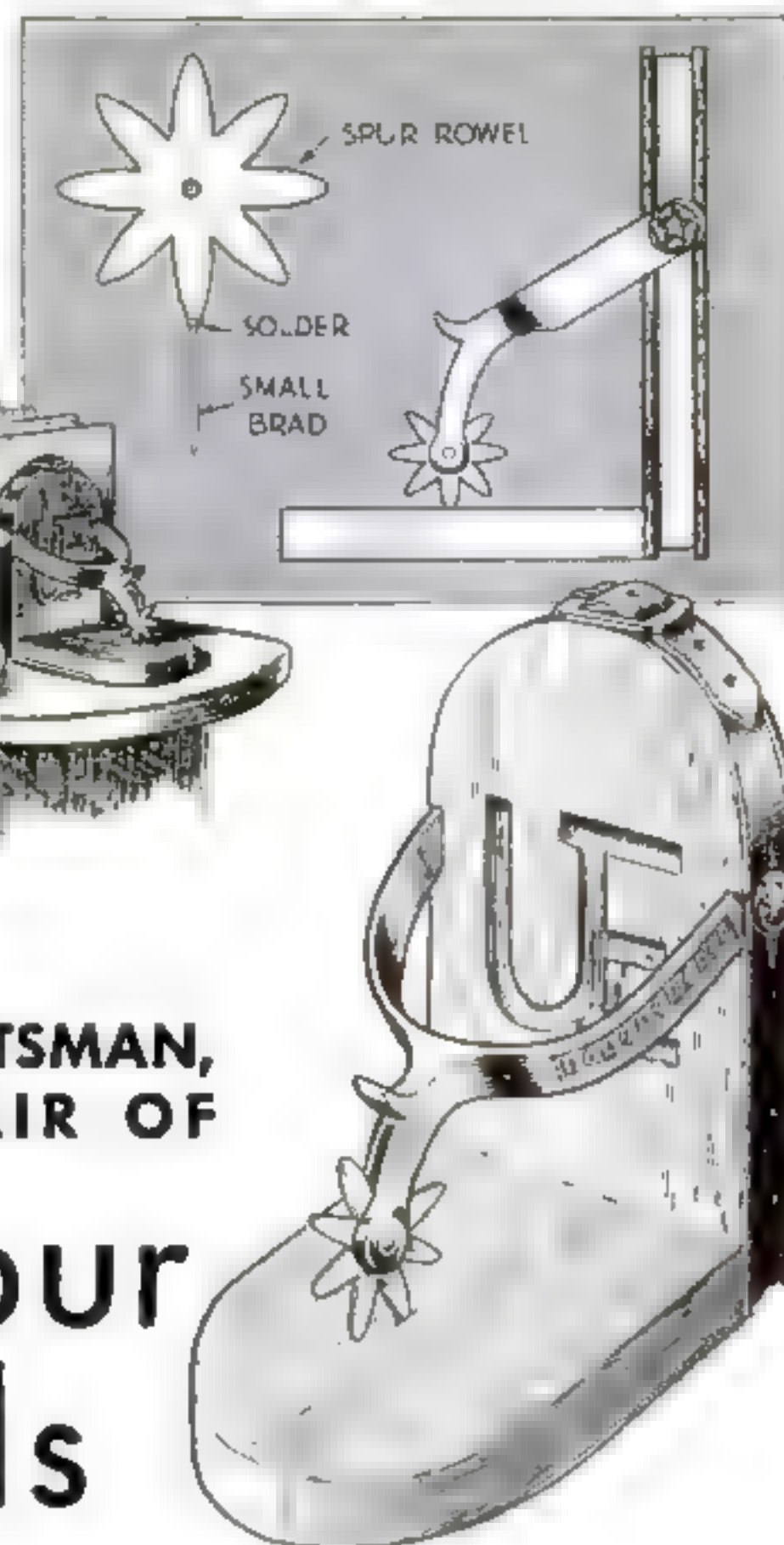
**GRAY WOLF, INDIAN CRAFTSMAN, DESIGNS A UNIQUE PAIR OF**

## Western Spur Book Ends

**IF YOU** like Western stories and movies or have ever spent a vacation on a dude ranch, you will appreciate a pair of book ends ornamented with genuine spurs.

The wood parts must be made to suit the spurs. A groove is cut in the edge of the upright member to hold the single spur strap, and a small recess

is made at an angle as shown in each edge so that the spur can be set in flush. Slits are cut in the strap where the buttons are applied on each side, and the lower ends are held in place with a small nail. For security, solder a long point to one of the spur points so it can be pressed into the wooden base.

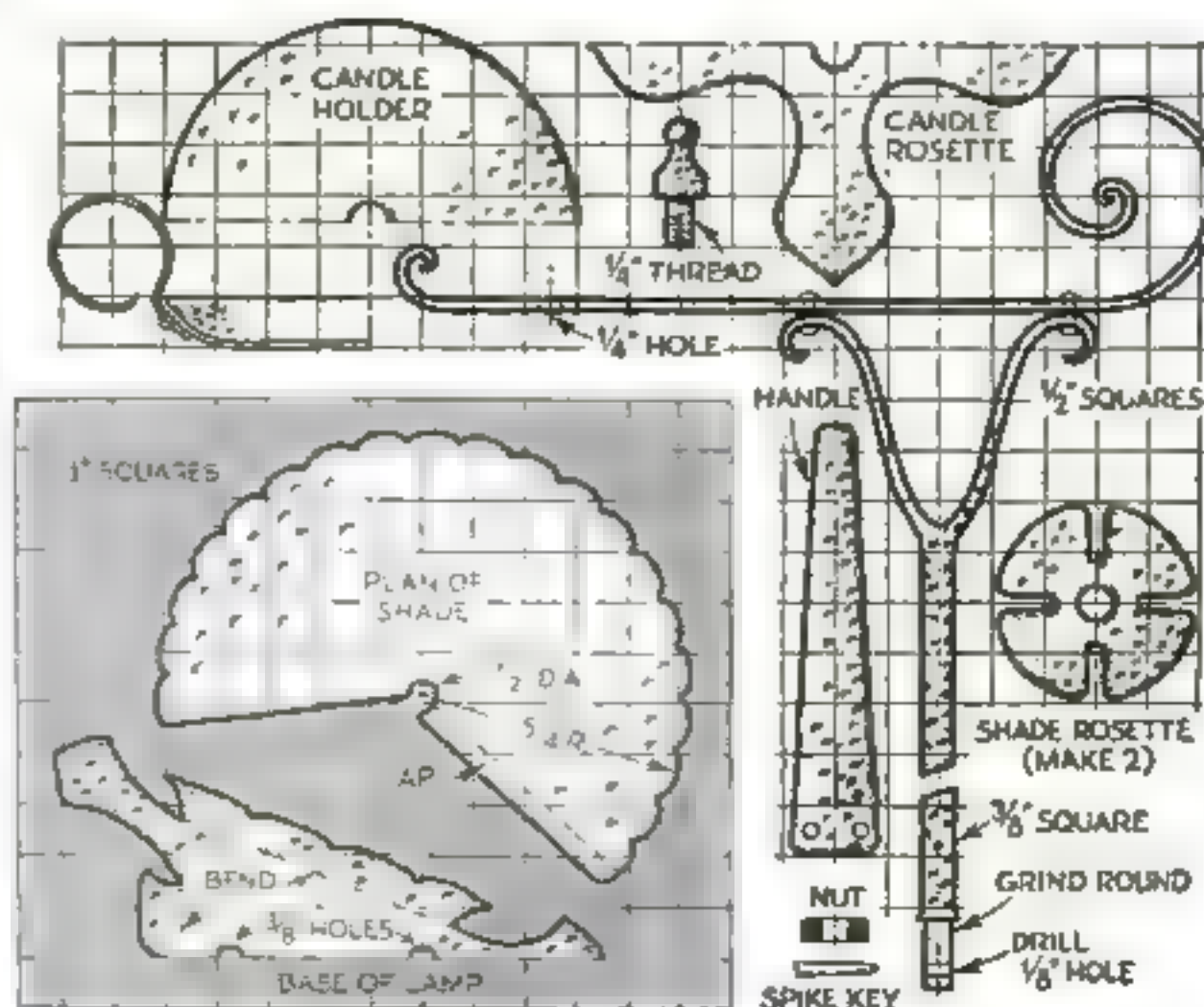


## Picturesque Iron Lamp in Swedish Style

**THIS** small Swedish-style lamp lends itself either to the forge or the cold-iron method of construction.

**Materials:** 1 pc. black iron  $\frac{3}{8}$  in. square by  $12\frac{1}{2}$  in. for pedestal;  $\frac{3}{8}$ -in. square nut for pedestal collar; 1 large spike for pedestal key; 1 pc.  $\frac{1}{2}$  by  $\frac{1}{2}$  by  $14\frac{1}{2}$ -in. strap iron for cross arm; 1 pc.  $\frac{1}{2}$ -in. round by 1-in. iron and  $\frac{1}{4}$ -in. nut for threaded knob; 1 pc. 20-gauge black iron 2 in. in diameter for top rosette on shade, and 1 pc.  $1\frac{1}{2}$  in. in

diameter for the inside rosette; 1 pc. 22-gauge black iron  $10\frac{1}{2}$  in. in diameter for the shade; 1 pc. 20-gauge iron  $4\frac{1}{2}$  in. in diameter for the leaf rosette, 1 pc. same material 4 in. in diameter for candle-holder tray, and 1 piece  $4\frac{1}{4}$  in. in length for tray handle; 1 pc. 14-gauge iron 9 by 11 in. for base; 7 black iron rivets  $\frac{1}{8}$  by  $\frac{1}{2}$  in.; 1 electric drip candle and socket; 1 pipe nipple 1 in. long with nut; 8 ft. electric lamp wire; 1 electric flame bulb.—D. W. OLSON.

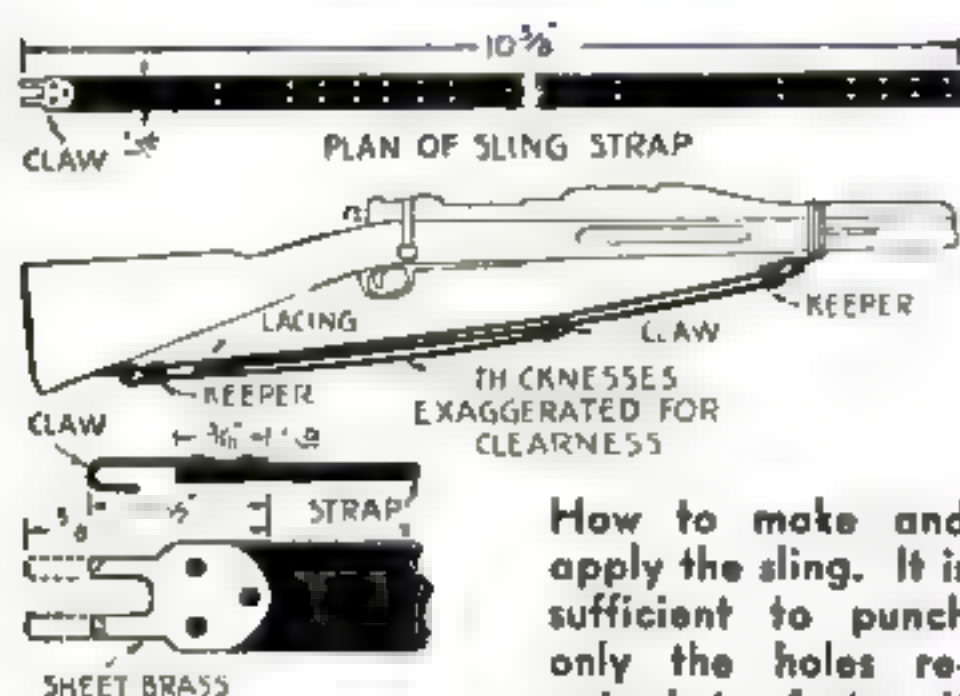


The ironwork is blued by heating, the high spots sanded until bright, and wax is then applied



## Springfield Rifle in Miniature

(Continued from page 66)



How to make and apply the sling. It is sufficient to punch only the holes required to fasten it

The bolt, bolt handle, front and rear sights, upper and lower bands, stacking swivel, and bayonet stud are painted with a mixture of black and blue paint to represent gun bluing.

This is the second article of a series. The first, by E. J. Tangerman, was on a flintlock pistol model (P.S.M., Jan. '38, p. 82).

## How to Drill and Cut Mica Accurately

TO DRILL holes accurately in mica or other thin, fragile sheets, first cut a template from wood, preferably 1 in. thick, and mark the location of the holes. Lay the mica or other material on a larger board, and place the template on top so that a little of the material shows on all sides of the template. Clamp the two boards tightly in the vise and bore through the template. Then, before loosening the vise, cut around the template as far as possible with a knife. The resulting piece will match the template exactly, and the holes will be clean-cut.

The writer has cut thousands of pieces of sheet mica for insulating motor-brush arms in this way.

If one bores through the wood at 45 deg., a perfect oval results; or if the bit spur is started in the crack between the boards and a hole bored lengthwise of the sheet, a perfectly straight slot with parallel sides is the result. Any attempt to cut a similar slot in mica with tin snips or a chisel would cause it to flake.—CHARLES M. GREEN.

## Holding Shoe Tongue in Line

WHEN the tongue of a shoe or boot has a tendency to shift to one side, cut two short slits in the tongue near the top and pass both ends of the lace through at a point between the last two eyelets. The lace will then hold the tongue in place.—A.W.S.

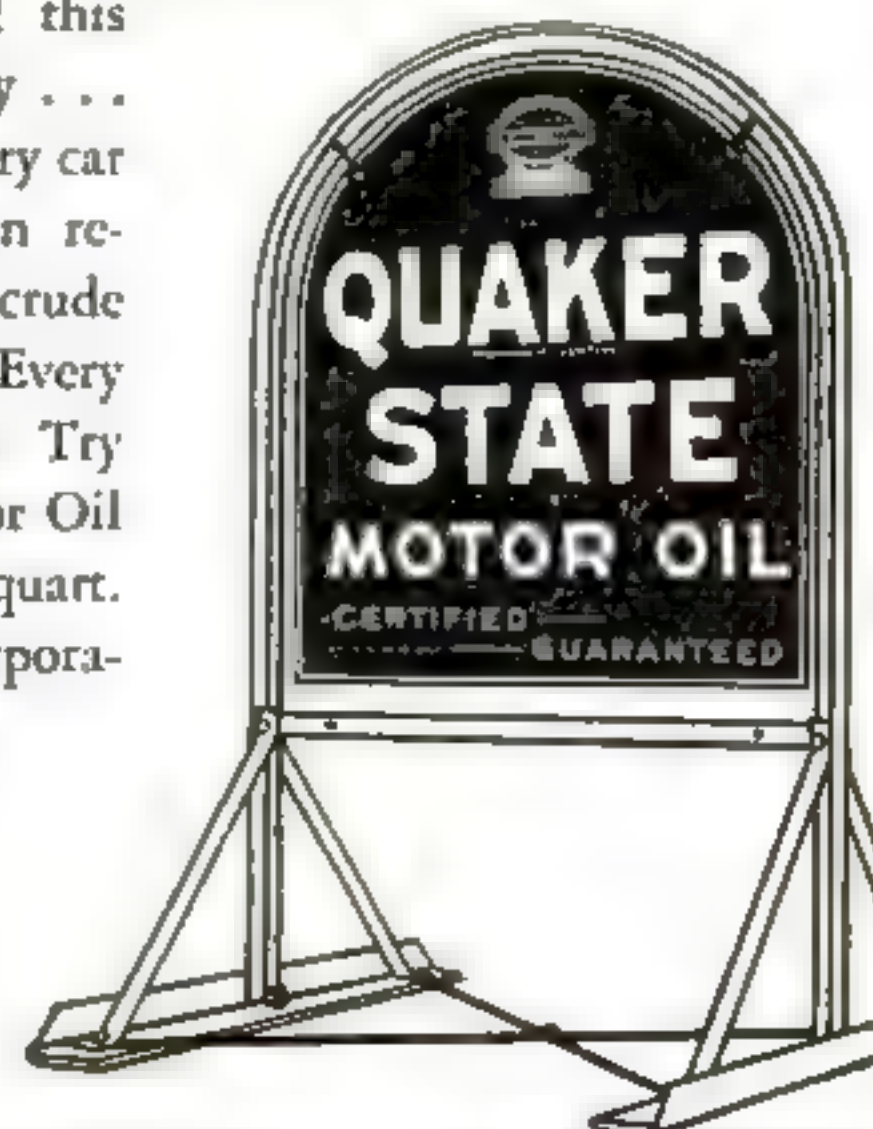
## Old Auto Top Boot Covers Lathe

My metal-working lathe is kept covered when not in use with a discarded top boot, which was left behind in my garage from an old touring car.—C. W. TALBOT, M. D.



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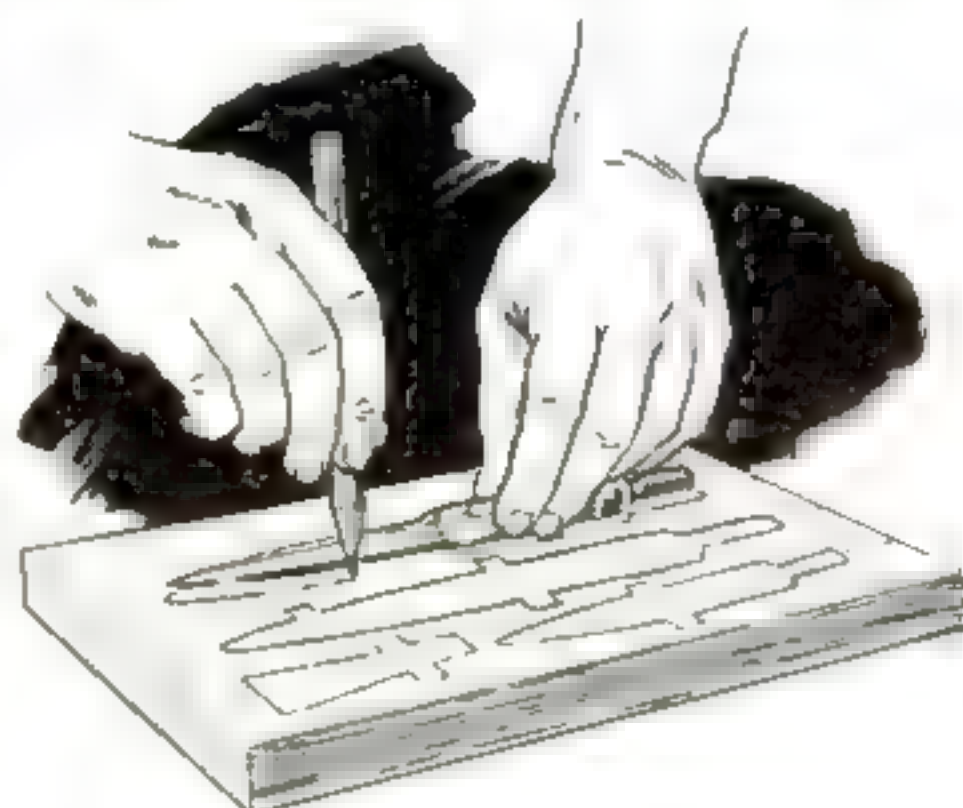
## A Neat Case for Drafting Tools

MANY draftsmen and engineers accumulate extra instruments, such as ruling pens, lettering pens, and possibly a beam compass. It is not hard or expensive to make a case to protect these tools.

**Materials.** About 1/3 yd. velvet, 1/2 yd. bookbinding cloth from a printing company, two snap fasteners, and a piece of white pine 1/2 in. thick.

**Form.** Cut the pine to the desired size. Lay the instruments on the block in the proper order and draw around each with a pencil, making the outlines as regular as possible. With jig or coping saw, begin at one end of the block and saw to the other end, continuing until the wood is divided into strips and all the spaces for the tools are cut out. Number the strips as cut.

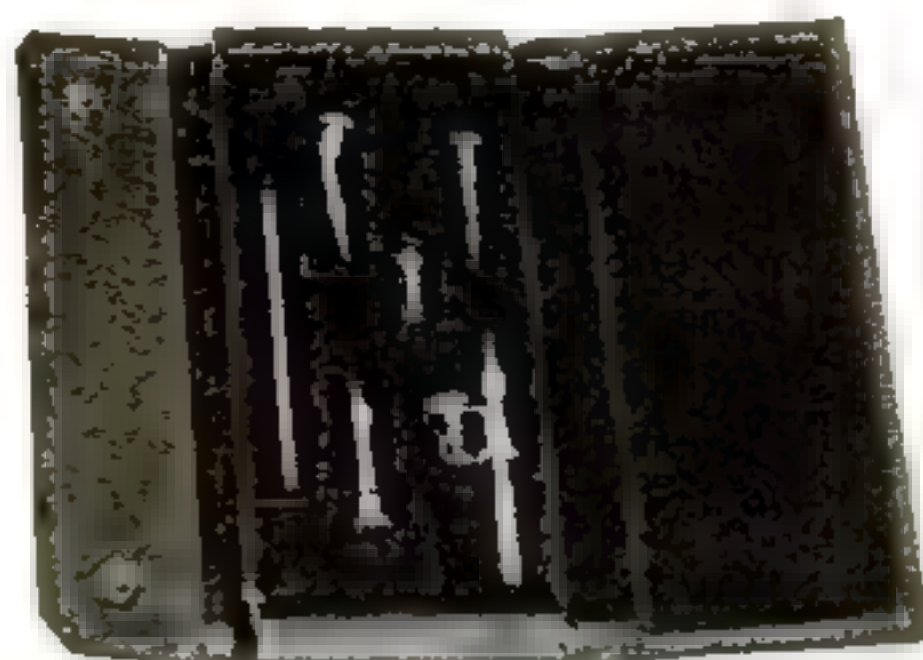
Glue strip 1 to a piece of cardboard a trifle larger than the original block of pine. Next glue on strip 2, placing a small temporary spacer of cardboard between strips 1 and 2. Continue until all the strips have been glued to the backing. When the glue has set, re-



Each instrument is laid on the block and a line traced around it as a sawing guide

move the spacers and trim off the excess cardboard.

**Lining.** Cut velvet as wide as the block is long and about 6 in. longer than the block is wide. Apply glue to the top of strip 1 only and, beginning about 3 in. in from the end of the velvet, press it down on strip 1. With a calling card, press the cloth into the space between the strips. Next apply glue to strip 2, and proceed until you have covered all the strips with velvet.



The finished case is designed to hold extra drafting instruments and various accessories



**Covering.** Cut a piece of bookbinding cloth about 1 in. wider than the block is long and three times the width of the block in length. With a yellow or white pencil, lay out the lines indicated in the diagram. Cut it out, fold

over and glue down the tabs marked C, and glue the block, velvet side up, to the space indicated. Glue a piece of cardboard to fit between the four fold lines in the spaces marked flap A and flap B. Next glue the velvet to the sides of the block and to the bookbinding cloth. It should extend to the lines marked "velvet cut." Now fold the bookbinding cloth over all

around on the fold line, gluing it down. Cut another piece of the cloth and cover the cardboard on the part marked flap A from the edge of the flap to about 1/2 in. over the velvet.

Cut cardboard the same size as the block of wood, and cover it on one side with velvet, allowing the material to extend over on the back of the cardboard about 1/2 in. all around.

**Fasteners.** Attach the snap fasteners to the two flaps, but be careful not to get them over a portion of the case that is cut out for an instrument. Glue the cardboard that has the velvet on one side to flap B after attaching the snap fasteners.—ROBERT W. CASE.

## Small Saws Improvised from Clock Wheels

WHILE working with some plastics, I needed a small circular saw to use with an electric hand tool. Since there was no saw among the many accessories of the tool and it would take some time to obtain one, I removed wheels of several different sizes from an old alarm clock, filed the teeth like a saw, and soldered the wheels firmly to their shafts. The teeth on the larger wheels were set slightly with a pair of thin-nosed pliers. I am still using these improvised saws, and they do excellent work.—LESTER C. TAYLOR.



## Guild Clubs Wind Up Successful Season

WITH a series of exhibitions, dinners, outings, and similar events, the majority of the home workshop clubs brought to a close a very successful season. A few clubs are continuing through the summer months, but there will be little activity until the fall.

One-evening projects made by members were given to women guests who attended the annual exhibition of the *Oklahoma City (Okla.) Homeworkshop Club*. Approximately thirty-five articles were displayed.

Prizes of tools donated by Stephen J. Milos, secretary, spurred the members of the *Ware (Mass.) Craftsman Guild* to display some remarkable pieces of their work in the club's monthly contests. Those receiving prizes one month were Arthur J. Comeau, the Rev. Edward W. McGlennon, and Emile F. St. Onge. Donald W. Howe spoke on stamp collecting and Dr. Tracey L. Roberson showed moving pictures.

Two clubs in *Buffalo, N. Y.*, moved into new quarters before the summer season arrived. The *Bison Homeworkshop Guild* held open house and displayed articles made by members. The *Bison Builders Guild* reports that membership increased as soon as the new club workshop was established.

Plans for toys to be made for distribution through the Goodfellows were discussed recently by the *Vicksburg (Miss.) Homeworkshop Club*, which is meeting regularly throughout the summer . . . Officers of the *Lincoln (Nebr.) Homeworkshop Club* were reelected as follows: Robert B. Dyer, president; J. L. Witmer, vice president; H. L. Culver, secretary-treasurer . . . George J. Terpak, president, has donated model-making apparatus to the *Lafayette Homeworkshop Club, Jersey City, N. J.*, . . . Alphonse Pszeny demonstrated the care and operation of the circular saw before the *Witch City Homeworkshop Club, Salem, Mass.* Officers are Thomas F. Quigley, president; Edward W. Kuc, vice president; John W. Pszeny, secretary; Henry J. Pszeny, treasurer; Stanley Lewandowski, librarian . . . John Boston, of the *Eddy and Long Homeworkshop Club, Chicago, Ill.*, has completed a sewing cabinet. S. Aloisio made a kitchen bench . . . The *Kileycrafters Club, Brooklyn, N. Y.*, which has been concentrating on radio construction, plans to take up woodworking next . . . Officers of the *Stout Arts and Crafts Club, Menomonie, Wisc.*, are Lawrence Schande, president; Wayne Pool, vice president; Kenneth Pederson, secretary; Orvis Johnson, treasurer.

The *Town Hall Homeworkshop Club, Ottawa, Ill.*, recently bestowed honorary membership upon J. Ray Bffel for his cooperation in arranging a meeting place and obtaining publicity.

START a home workshop club in your neighborhood. All you need to know is contained in a bulletin which will be sent free upon receipt of a self-addressed stamped envelope.

# A kind friend Then..and now

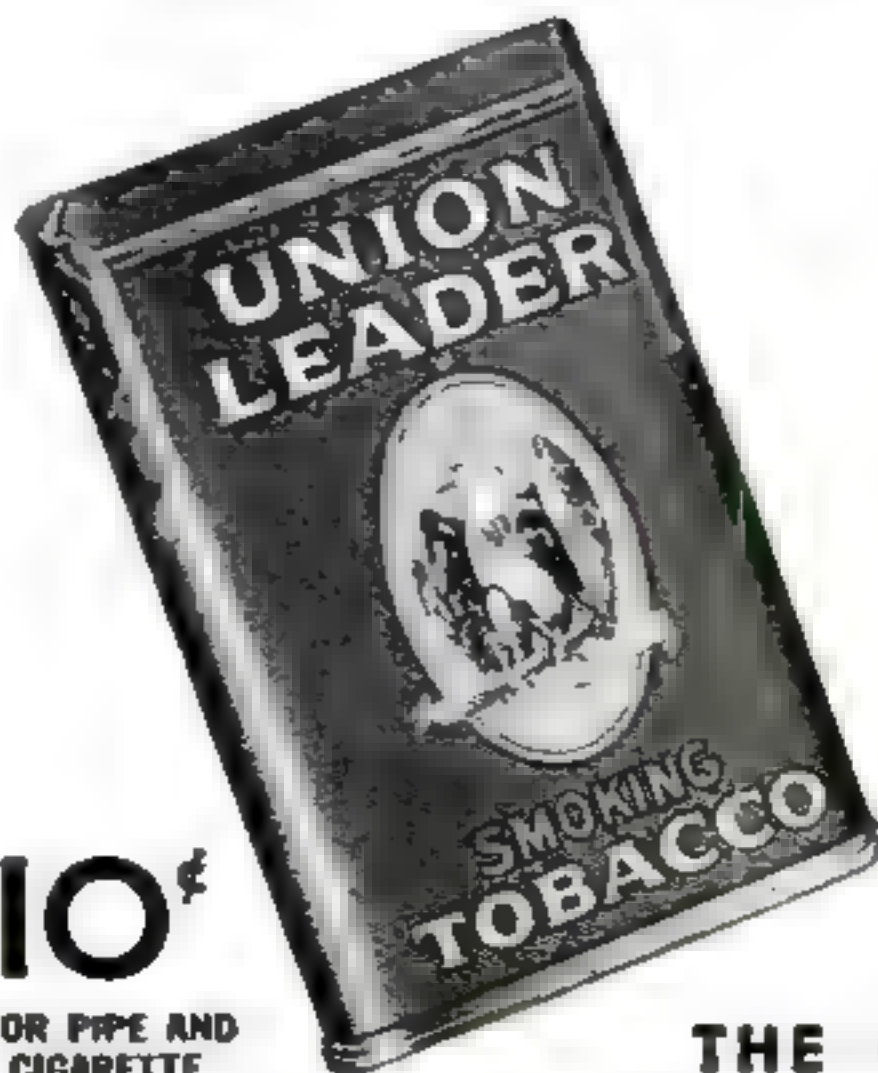


IN 1910—"I first smoked Union Leader when Joe Winders, who ran the general store over at the Forks, gave me some to try. 'Long as you live,' says Joe, 'you'll never meet up with a sweeter pipe tobacco.' And after 28 years of smokin' Union Leader, I still think Joe was right."



TODAY... "Seein' is believin'. And here I am 28 years after that other picture, and still pal-ling around with Union Leader. When a tobacco is friendly and gentle and satisfying as long as that . . . a fellow has a right to think it's come pretty close to makin' good."—Harry C. Bratt, Box 58, Housick, New York.

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ALWAYS . . . For a third of a century UNION LEADER has been famed for its richness of flavor and freedom from bite! Choice, hill-grown Kentucky Burley gives Union Leader that appealing taste. Long aging in oaken casks adds smoothness and mellowness. A special process removes all harshness! Let a dime introduce you to a big tin of Union Leader, America's friendliest tobacco.

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MOTORISTS who use SANI-FLUSH regularly never have to worry about clogged, overheated radiators. SANI-FLUSH keeps radiators clean. Water circulates freely. You save power. And you don't risk costly repair bills. SANI-FLUSH is inexpensive. It's easy to use, and perfectly safe.

Just pour 10c worth of this scientific powder in the radiator. (25c for the largest trucks and tractors.) Follow directions on the can. Drain. Flush. Refill with clean water. That's all! SANI-FLUSH removes rust, scale and sludge from the delicate veins of the radiator. Cars run cool. SANI-FLUSH cannot injure motor or fittings. You'll find SANI-FLUSH in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

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KEEPS RADIATORS CLEAN **NOT CAUSTIC**

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WHEN you build a ship model, full-size blueprints are of inestimable help. You can take dimensions right off the drawings and compare completed parts directly with the correct sizes and shapes. Plans are available for about fifty different models.

We also have blueprints for boats, radio sets, furniture, and miscellaneous novelties. If you do not see what you want in the list below, send a stamped, self-addressed envelope for our complete list.

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Aircraft Carrier <i>Saratoga</i> (18 in.) and a <i>Flush-Deck Destroyer</i> (6 1/4 in.), 226-227-R.....	.75
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(Construction kits are available for some of these models. See page 11.)

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All-Purpose Boat, 11 ft. 5 in. long, for sails, outboard motor, or rowing, 331-R.....	.75
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Canoe, 16-ft. canvas-covered kayak, with sail, 192-193-194-R.....	1.00
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Fisherman's Outboard Boat, 9 ft. 3 in. or 11 ft. 6 in. long, for motors from 3 to 16 h.p.; can also be rowed, 344-345-R.....	.75
Folding Duck Boat, 13 ft. long, 170-R.....	.50
High-Speed Boat for Small Outboard Motors (7 ft. 11 in. long), 257-R.....	.50
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With Blueprint No. 326-R you can make a 14-in. model of a New Bedford whaleboat

Motorboat-Rowboat, 16 ft. long, decked hull, for use with outboard or inboard drives or oars, 149-R.....	.50
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Racing Sailboat <i>Blackcat</i> (13 ft. 4 in. long, 5 ft. beam, weighs 250 lb., Marconi rigged), 321-322-323-R.....	1.00
Runabout, 15 1/2 ft. long, detachable top, seats that fold into bunks; for use with outboard or inboard drives, 175-176-177-R.....	1.00
Sectional Rowboat, 9 ft. 8 in. long, can be used with small outboard motor; all wood construction, 340-341-R.....	.75
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All-Wave Portable Receiver (two tubes, operated by battery), 217-R.....	.50
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## Turning Model Parts

(Continued from page 61)

same manner as regular lathe tools.

Dowels made from white or type metal or any of the harder metals with a low melting point may be used for small parts such as cannon and metal deadeyes. Such dowels are quickly made. Sheets of heavy paper are wrapped around a wooden dowel of the desired size to form a tube. These tubes are slipped from the longer dowel onto shorter ones that project from a wooden base. The metal is melted and poured into the tubes, where it is allowed to cool. The metal rods are then used in the same manner as the wooden dowels.

The worker may also make his own masts and yards for his ship models by the following method: The dowel is placed in the chucks, allowing about  $\frac{1}{2}$  in. extra stock on each end. As these dowels must be perfectly true, it is best not to use a clamp screw, but to pass a short length of wire through the dowel next to the headstock chuck. The ends of the wire are slightly bent to prevent its coming out. A small tack placed in the insert will prevent the wire and the dowel from revolving. If desired, the dowel may first be reduced to the required size near the ends of the turning. The actual shaping is done by using a coarse grade of sandpaper folded around a sanding block. To prevent the turning from springing away from the sandpaper, a backing block is used as shown. For the final sanding, a strip of sandpaper is wrapped once around the work. The wrapping is pulled from one end of the strip to the other as the paper is moved along the work.

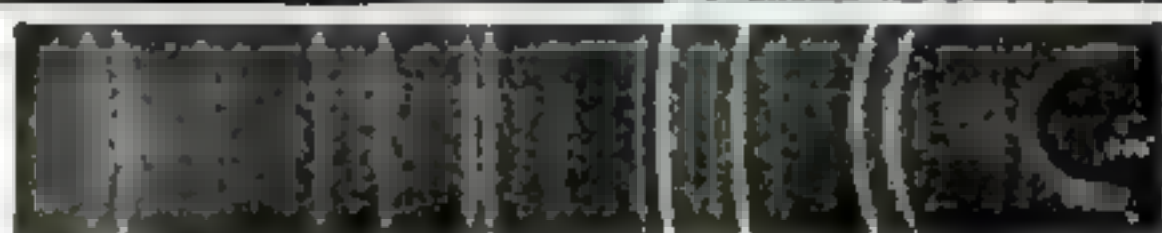
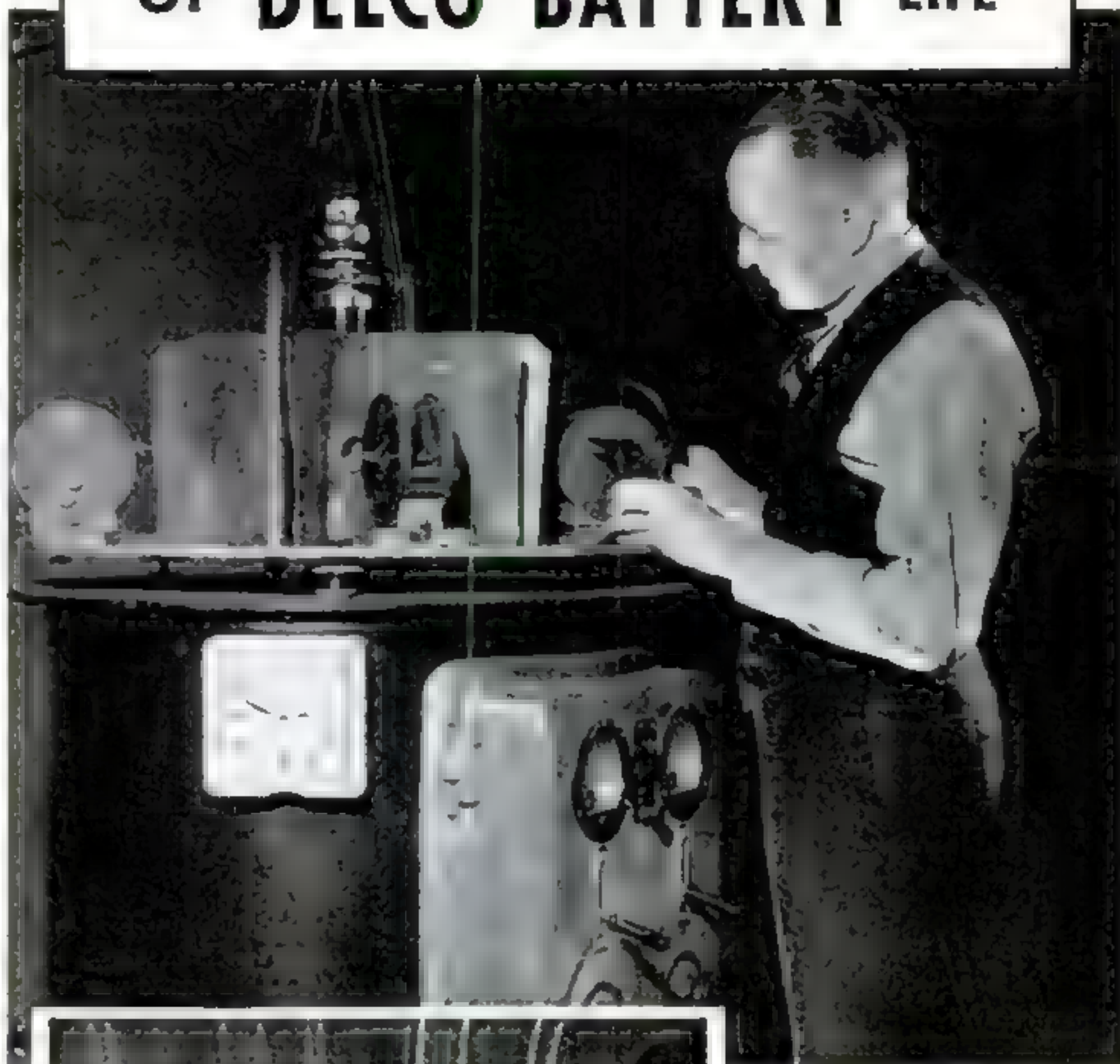
## Emergency Gasket Made from Friction Tape

WHEN gaskets have to be replaced and sheet cork or other material is not available in the desired thickness, a satisfactory and permanent substitute may be cut with a sharp knife from a sheet made by laying parallel rows of friction tape so that each slightly overlaps the next. Additional layers are then applied until the sheet has sufficient thickness. It is then rolled or tapped to insure adhesion. By alternating the direction of the rows in each successive layer, the tensile strength is improved, and this may be further increased by inserting a layer of screen wire, fiber board, heavy canvas, or similar material.—LESTER J. KING.

## How to Hang Small Pictures Without Damaging Plaster

HANGERS for small pictures can be made from discarded steel phonograph needles. Hold the needle at a slight angle and drive it in to within about  $\frac{1}{4}$  in. of the thick end. Although this hanger holds considerable weight, it can be removed from the plaster without leaving an unsightly mark.—E. D.

## THE X-RAY TELLS THE STORY OF DELCO BATTERY LIFE



This X-ray spectrogram shows how finely divided metallic lead appears on the X-ray film.

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## Aviation's Guinea Pigs

(Continued from page 41)

propeller shaft, fastened a sixteen-bladed fan to the shaft, and now the fan drives air into the engine compartment according to the propeller's speed.

More speed jobs are coming, trim ships built in out-of-the-way places by pilots and unknown engineers who hope to retrieve for America the world's land-plane speed records. *Mr. Smoothie* is one, the *Goon* another, a *Ryder* low-wing speedster a third, a *Folkerts* special the fourth. Each, when it flashes past the stands at the National Air Races in September, will embody some new design or application of power or mechanics intended to increase the speed another few miles an hour.

WHEN Lee Williams and Bud Pearson decided to build *Mr. Smoothie*, they gave Rodney Nimmo, a California artist, this order: "Design this ship like a torpedo, and make it smooth as silk."

In a Venice, Calif., garage *Mr. Smoothie* took shape, and when it appears late this summer, the crowds will see the highly tapered cantilever wings winding around the pylons, but they will miss the tubular steel structure over which a plywood surface has been fastened. Steel for strength, plywood to avoid indentations and flutter which cut down speed in fabric-covered airplanes. An 800-horsepower, twelve-cylinder water-cooled engine, "souped up" to get another 200 horsepower, will lift *Mr. Smoothie* into the air, and the long, thin fuselage, streamlined around a long gasoline tank, will ride on wings which stretch no farther than nineteen feet from tip to tip.

For five years Chester, who built his *Jeep* at St. Louis and proceeded to show his tail to pilots everywhere, has been a consistent money winner. Nearly \$40,000 in prizes have come his way. When *Jeep* began to fall behind, Chester started looking for something the other ships did not have.

"Most of them have fine streamlining," he observed, "but the little fellows have passed up two-pitch props and mid-wings."

CHESTER studied the problem, found a propeller whose pitch would change automatically through air pressure on the nose when his job reached 100 miles an hour. He set out to construct a new plane with the wing placed midway between top and bottom of the fuselage—a flying bullet. He bought an engine and reversed the drive, since the French propeller is engineered to turn clockwise. With this prop taking bigger bites of air, he hopes to save 200 feet in take-offs, and be picking up speed in the air while his competitors are still climbing.

To attain the greatest possible speed, the tail wheel on his new ship retracts into a recess by the same gear which pulls the landing wheels

(Continued on page 93)

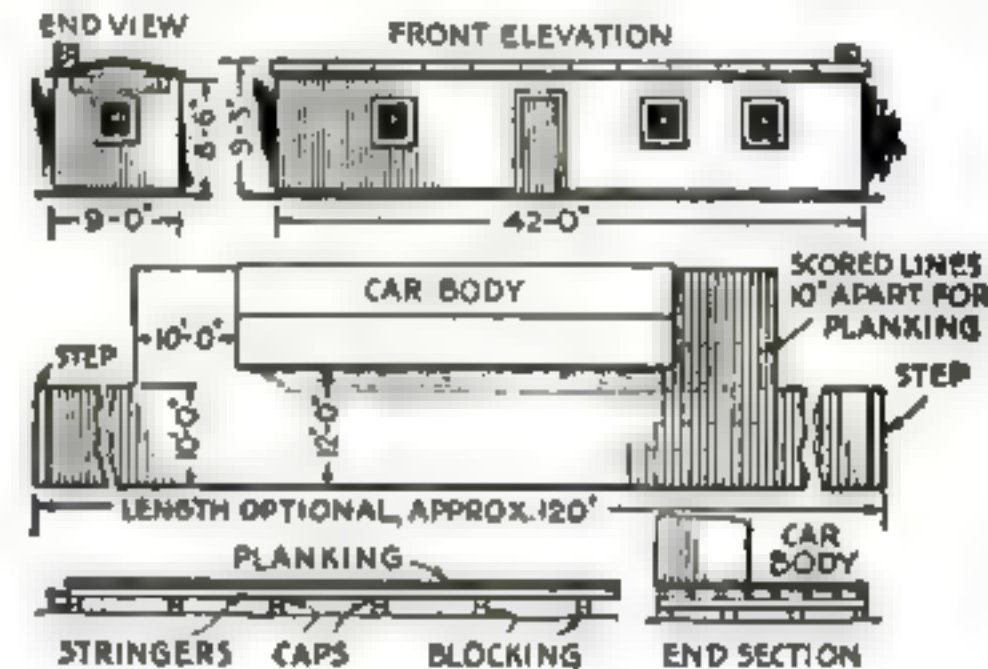


A model railway flag stop with depot and platform made of cardboard and thin wood

## Box-Car Body Serves as Flag-Stop Depot

IF YOU have a spur track along the main line of your model railway, a flag-stop depot can be built to represent a condemned box-car body, which is often used for the purpose. Sides and ends are drawn to scale on medium weight cardboard and scored with a sharp tool to represent the siding. The window openings are cut out, and thin celluloid is glued inside, the window sash first being outlined on the celluloid with black paint or drawing ink.

The base, of thin white pine, is cut to fit inside the four walls, which are glued to it. Then the roof is added in two pieces to give a definite ridge line. Car bodies of this kind often have a tarpaper roof added over the regular roof, and there are usually narrow eaves from 3 to 6 in. wide. A square brick chimney may be applied, or a piece of



Actual dimensions are given on these drawings so the model may be made to any scale

paper rolled up and painted black to represent a metal smoke pipe. Paint the depot box-car red, the roof dark gray.

The platform is a piece of cardboard cut as shown and either scored to look like planks or, better still, covered with narrow strips of very thin wood. Stringers of balsa are glued to the underside, and the posts are then added. If the wood platform looks too new, stain it with water to which a few drops of ink have been added.—J. W. CLEMENT.

## Boring Thin Wood Strips

IN BORING 1-in. holes in thin wooden strips, I had a high percentage of splits until I first drilled a guide hole with a small twist drill for the lead screw of the bit. By this method I was able to bore holes of a diameter almost equal to the width of the strips without splitting them.—W. S. WHITESIDE.



## Aviation's Guinea Pigs

(Continued from page 92)

up into the fuselage. By this means, Chester hopes to gain another two miles an hour, which may mean the difference between first and second place; a difference of several thousand dollars a year.

Keith Ryder recently completed at Los Angeles a low-wing speed ship, and on the first test flight Roger Don Rae looped, rolled, and dived the plane to demonstrate its stability and strength. In Kansas City, Ray Folkerts recently completed a big brother to the plane which carried Gotch to oblivion. Less wing and finer streamlining mark this creation, which Joe Jacobsen hopes will crack old records.

**B**LIND flying has come to mean piloting by instrument, but the term must be taken literally by these merchants of speed. They sit on parachutes, virtually on the floor of the fuselage, and cannot see dead ahead. Only by the sudden turbulence of the air does one know he is about to overtake a leader. So warned, he swings wide and climbs. Directly in front of the stands Marion McKeen overtook Ray Moore, flying Frank Fuller's Seversky pursuit plane. Flying slightly to one side, Moore did not hit the prop wash, and saw the Seversky only when their wings almost collided.

Not all the thrills come during a race. Tony LeVier took off on a test flight from an airport near Cleveland, Ohio, and scarcely had his wheels cleared the ground when the plane turned on its side. Unable to right the ship easily, LeVier jammed the stick hard left, throwing the plane into upright position, and landed without leaving the field.

Speed, and more speed, is the eternal goal of the closed-course pilots. Furio Nicolet of Italy set a new straightaway record for land planes last year when he flew a bomber-type monoplane 323 miles an hour. No American ship has come within sixty-five miles of this mark. Which will catch up first, some big plane of the unlimited-horsepower class, or one of the tiny flying gas cans?

**L**OOK back a few years, and you learn that Jimmy Doolittle hit 252.686 miles an hour in the Thompson Trophy race. That was 1932. Five summers later Rudy Kling took the trophy in a Folkerts Special at 256.910. Only four miles faster. As for the middle class, of 550 cubic inches displacement, Ray Moore's record of 171.671, set in 1932, jumped to 232.272 when Kling established this mark a half-decade later.

Now for the babies. Benny Howard's "Pete" crowded the pylons to win at 132.246 in 1932, and Wittman beat out the field in the National Air Races of 1937 with a speed of 245.3. Almost double, and with an engine of only 375 cubic inches displacement. Where they will go next, only time can tell.



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## Is Water Always Wet?

(Continued from page 75)

air that supports it in the water. In the course of ten minutes or so, however, the water will slowly displace this air film and wet the charcoal, which eventually will sink to the bottom of the vessel with the glass.

Not only do scientists frequently have to revise their ideas about how familiar things work, but they are also constantly discovering new phenomena in supposedly well-understood reactions and industrial processes. Still awaiting thorough investigation is a curious "firefly glow" produced when oil is cracked or broken up by heat—a striking effect that does not appear to have been discovered until recently, but one which you can easily reproduce in your own laboratory.

FIRST you will need a piece of glass tubing about three eighths of an inch in diameter, and a foot long. Heat-resisting glass may be used, but is not essential, since the tubing will not be heated red-hot. Mount the tube at a slant of about forty-five degrees, and keep it heated at its center, with a Bunsen burner, to a temperature below red heat. A flame-spreading attachment for the burner is desirable, to distribute the heat along several inches of the tube's length.

From an oil can or medicine dropper, let a drop of ordinary motor oil run down the inside of the heated tube every five seconds or so. When the oil meets the hot part of the glass, "pyrolysis," or chemical decomposition caused by heat, will occur. Any part of the oil that is not decomposed will drip from the bottom of the tube, where it should be caught in a tin can or other non-combustible container.

Within the tube, the decomposition of the oil produces a variety of gaseous products. Combustible gases like methane, or marsh gas, are formed, and carbon dioxide is also produced by a process of partial oxidation. A white cloud of the vapors will be seen hovering in the tube, or carried up it by the draft of warm air.

DARKEN the room, while this is proceeding, and at once you will observe the strange luminescence. Several inches of the tube will glow with the peculiar light. Evidently it is produced by the partial oxidation of the hydrocarbon vapors, much as the oxidation of certain organic chemicals produces the light of the firefly.

Oil from many sources has been reported to exhibit the remarkable phenomenon, including linseed, cottonseed, and olive oil. After tests with vegetable oils, dispose of the oil that drips from the lower end of the tube by burning it, to avoid any possibility of its spontaneous combustion elsewhere.

You can admit oil automatically to the "cracking" tube with a small separatory funnel. This is attached with rubber tubing to a medicine-dropper tip suspended in the top of the tube.

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## Inventor for Hire

(Continued from page 31)

Parlini been stumped completely by a client's request. That time a man arrived with a rough sketch for a radically new kind of power plant. He wanted Parlini to make a working model. The machine consisted of a U-shaped trough, suggesting half an automobile tire, with a piston attached at each end. A steel ball, rolling from one end to the other, was to rock the trough and work the pistons. Once he started the ball rolling, the inventor explained, the machine would rock back and forth indefinitely.

"But how are you going to prevent friction from bringing the ball to a stop?" Parlini asked.

"Aha!" said his visitor. "That is what I want you to tell me."

**W**ORKABLE inventions listed on the record books of Parlini's laboratory run all the way from improved knitting needles and air-conditioned tobacco pipes to collapsible umbrellas and rotating lip sticks. The biggest job so far was recently completed for an inventor from Arizona. It was an immense placer-mining machine that weighed tons and had to be set up for its tests in an outlying section of New York, miles from the laboratory.

Inventing for inventors is a job that Parlini finds interesting and varied. It is like playing a game and getting paid for it. In fact, he finds the work so engrossing that he rarely takes a vacation. When he feels the need of relaxation, he says, he invents photographic equipment for himself as a hobby.

## Alternating Current Makes Wire "Sing"

**A**N electric wire that "sang," when current flowed through it, gave an unexpected twist to a home experiment recently reported by an engineer of Valdoie, France. Intending to show his young sons how electricity makes a lamp filament incandescent, he strung up a pure nickel wire about forty-three inches long, 1/250th of an inch in diameter, and of about 110 ohms resistance when cold. To the ends of the horizontal wire, after darkening the room, he applied a fifty-cycle alternating current of 110 volts. Besides becoming incandescent, as he expected, the wire astonished him by emitting a musical hum. Examination showed that it was vibrating like a violin string. Its "nodes," or stationary points, glowed brightly, while the vibrating parts were dark, because of their greater heat loss to the surrounding air. The experimenter has suggested that, by multiplying the number of wires, the principle might be given practical application in musical instruments of new design. The engineer concluded that the fluctuation in magnetic field produced by alternating current set up the vibrations in the wire.

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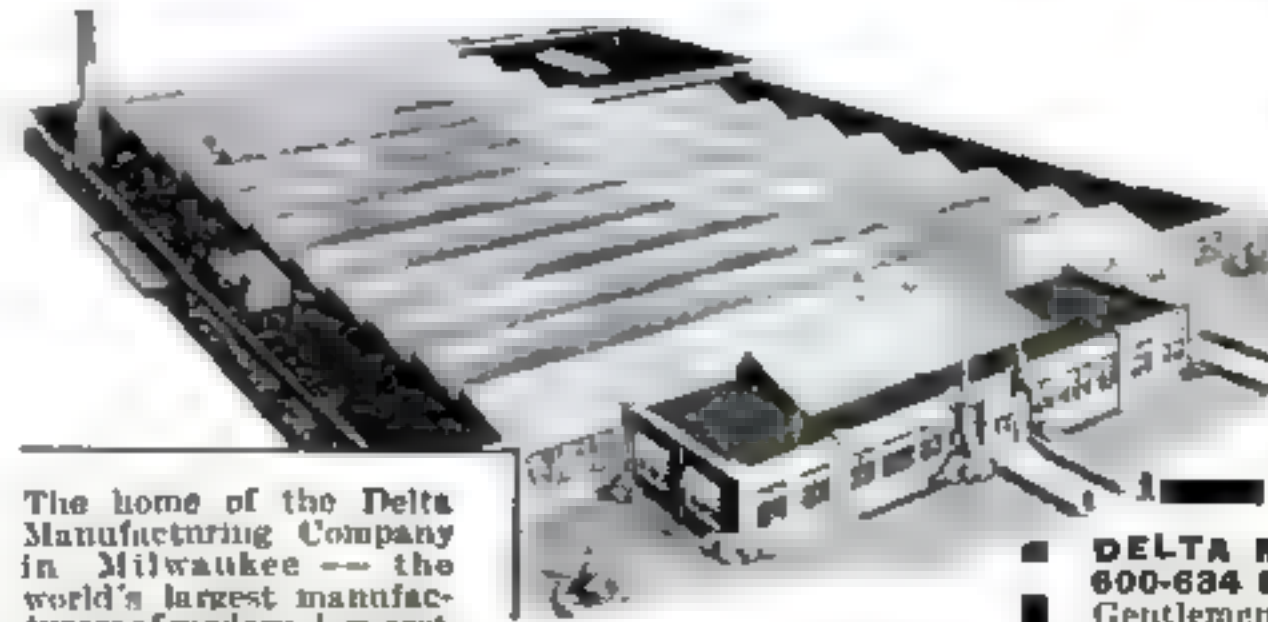
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Ask For An

## Roadside Water Plants Under the Microscope

(Continued from page 73)

chlorophyll in the filament-type algae of which it is composed. However, there are many algal forms which are brown, red, yellow, or purplish-green in color. It is these plants, incidentally, which give color to the rocklike deposits around some of the hot springs in Yellowstone National Park. The plants live in the waters of the springs, although they may be within forty degrees of the boiling point.

THE algae that are red, brown, or some other color are really green at heart. If you find some of these filaments, you can perform an interesting experiment that reveals the presence of green chlorophyll. Put some water in a test tube or small bottle and add several drops of chloroform. Shake the bottle vigorously, and then let the chloroform settle. Pour off the water, which now contains a little chloroform, and put the colored algae into it. The chloroform will extract the phycoerythrin which modified the basic color of the cells, and leave the bright-green chlorophyll. You can extract the green chlorophyll by soaking the algae in alcohol.

The chlorophyll has an important job to perform. It takes part, in some mysterious way, in the process by which the plant transforms carbon dioxide, water, and sunlight into starch that it can use for food.

By making repeated observations on algae over a period of days or weeks, you can learn more about their habits than by single inspections. Spirogyra, for example, may be discovered only in the form of simple filaments, on your first exploration. However, one of the most interesting stages of its life occurs during conjugation, when two parallel filaments are connected by canals, producing a ladderlike formation. This is the usual method by which Spirogyra reproduces. The two filaments, one male and the other female, become joined together, and send out hairlike projections called papillae, which unite to form canals joining adjacent cells. The contents of the male cell pass through the canal into the female cell to form a zygote, or spore, which later develops into a new plant. The emptied male-filament cells eventually rot away.

IN YOUR study of Spirogyra and other algae, you will find it interesting to apply iodine or some other stain to bring out cell details. Iodine, for instance, will make the nucleus more prominent, and when applied in a solution strong enough to darken the entire cell contents, makes the cellulose capsule easier to see.

The filamentous algae comprise only a small percentage of all algal forms known. The group includes the diatoms and a multitude of others of almost every conceivable form.



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## Gus Tunes a Car By Ear

(Continued from page 54)

that your car won't give you any trouble for a few days," he assured her. "But it's only a temporary repair. If you'd like me to, I'll order a new distributor head, and install it any time it's convenient for you to bring your car in."

"Yes—do that, please," Mrs. Oliphant directed. "Really, I'm tremendously impressed! You know, I heard what the young man whispered to you when I first drove in, and I thought it was a silly joke of some kind. Imagine running a repair shop by remote control!"

AFTER she had driven off, Harry looked at Gus. "All right, Sherlock Holmes," he said. "Let's have it!"

Gus grinned at him. "Just educated ears—and experience," he explained. "You'll get both in time. When an engine runs smoothly while it's idling, and then starts to raise a ruckus when you speed it up, nine times out of ten the trouble is in the distributor or the coil. And when your ears tell you that the cylinders aren't all firing at the right time, it's an odds-on bet that the trouble is caused by a Y-shaped crack in the distributor head. You see what happens, don't you? The spark follows the crack. Drilling a hole larger than the crack is wide, just where the Y branches, stops the spark from jumping, and stopping the spark from jumping stops the trouble. Get it?"

"Yes, I get it," Harry said. "But suppose the trouble isn't caused by a crack in the distributor head. Suppose the engine is just missing fire occasionally. Where do you go from there, Gus?"

"Well, it might be caused by the coil," Gus told him. "That's easy enough to check on. All you have to do is to pull the wire out of the distributor head, while the engine is running, and hold its end fairly close to the place where you pulled it out. If the coil is O.K., you'll get a nice blue spark. If the coil is weak, you'll get a yellow spark. Don't waste any time on a weak coil. Put in a new one."

ANOTHER cause of a missing engine that you run into now and then is a condenser that can't stand the voltage. You can spot that by the contacts—they'll be gray if the condenser is all right, but blue if it is weak. Sometimes even a brand-new condenser is weak. The remedy is the same as for a weak coil—throw it away and put in a new one.

"Once in a while, hard scale on new distributor points is the cause of an engine missing. The scale is a sort of glaze that is so darned hard that you can't cut it, and that the juice can't get through it. There's nothing that I know of that you can do about it, except put in new points."

"Sometimes an engine will run all right at low speed, but heat up badly at higher speeds, as if it were running on

(Continued on page 98)

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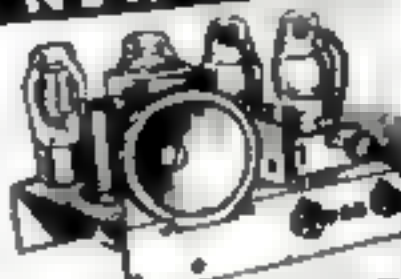
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## Gus Tunes a Car By Ear

(Continued from page 97)

a retarded spark. Occasionally the cause of that will be a kink or some dirt in that copper vacuum tube that, on many cars, runs from the carburetor to the distributor.

"You know what the governor is, don't you—that little do-funny with two weights and two small springs, inside the distributor? When you are running at low speed, the governor is in its normal position, which is closed; as you speed up your engine it should expand, and set the spark timing ahead. The governor is often vacuum-regulated, so if there is a kink or any other kind of stoppage in that copper tube between the carburetor and the distributor, the governor won't be adjusted to the speed and load, and the timing may be late. Then the engine will heat up badly."

"HOW about the spark plugs?" Harry asked. "Doesn't using the wrong ones make an engine pop when you step on it?"

"Using the wrong spark plugs causes plenty of grief," Gus agreed. "That's especially true with these new high-compression engines—you've got to use the plug recommended by the manufacturer to get the best performance. With the older engines, the right plug wasn't quite so important."

"Thanks," said Harry. "I'll try to remember all that dope. But, say, Gus, come clean! When you figured out what was wrong with Mrs. Oliphant's car, how much was it what your ears told you—and how much just plain guessing?"

"My ears told me plenty! That's what they're for!" Gus said. "But there's no harm in guessing—so long as you know how to guess right!"

## POPULAR SCIENCE

### Question Bee

FIGURE out your score in the Question Bee on page 50 by checking your answers against the correct ones listed below. Give yourself four points for each question answered correctly. From 80 to 88 is good; 92 to 100 is excellent.

#### QUESTIONS

- |      |       |       |       |       |
|------|-------|-------|-------|-------|
| 1. b | 6. b  | 11. b | 16. b | 21. c |
| 2. c | 7. c  | 12. d | 17. d | 22. d |
| 3. d | 8. b  | 13. b | 18. c | 23. c |
| 4. c | 9. a  | 14. b | 19. c | 24. c |
| 5. b | 10. c | 15. d | 20. b | 25. c |

#### PICTURES

- |            |             |
|------------|-------------|
| 1. anther  | 6. stamen   |
| 2. stigma  | 7. petals   |
| 3. sepals  | 8. filament |
| 4. style   | 9. ovary    |
| 5. corolla | 10. calyx   |
| 11. pistil |             |

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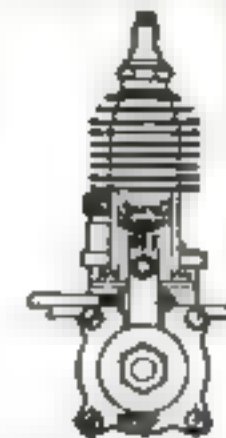
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**This One**



**PJDP-QU9-X6EP**



# Modern Eye Magic

(Continued from page 45)

cataract, which is a cloudy, milky spot in the eye's lens that distorts the light rays. The wearer simply moves his head until the opaque spot in his eye is behind a space between pinholes. Freed of interfering rays, the eye gets a clearer picture. An improved version of the multiple-pinhole lens has criss-cross bars that can be rotated until the best position for the eye is found; then they are locked in place with a set screw.

If one eye is bad enough to be a nuisance instead of a help, the optometrist may put an "occluder" in front of it—a pebbly-surfaced lens which shuts off the offending eye's vision without being noticeable to other people.

AND when a big game hunter takes down his express rifle, he may also don a pair of amber spectacles, knowing that he can aim more accurately when there is no interference from light of other colors. Like any other lens, the eye works best in monochromatic, or one-color, light. Then, too, the human eye is most sensitive to yellow light, and by "tuning" to this color the hunter makes his vision keenest.

Applying the same principle, an automobile manufacturer found that in delicate lathe work, machinists can do their most precise work under the yellow-green light of the mercury-vapor tube. This light is nearly all of one color and brings in no conflicting rays. Sheets of stainless steel and other bright metal reveal their flaws amazingly under this monochromatic light. Its use helps inspectors to spot defective parts. A machinist may have two or three big mercury-vapor lamps for his job alone, but he needs them when he is working on parts that have to be accurate to a ten-thousandth of an inch. In big western airplane factories, mechanics work under mercury-vapor tubes fifty inches long. Since light reaches the work from all sides, there are no confusing shadows. There is no discomfort from heat, either. The light looks cool—and is cool.

A queer fact as yet unexplained is the recent discovery that a small amount of complementary color acts as a sensitizer to the eye. Girls who sorted oranges on conveyor belts were helped when green cards were placed above the sorting tables, outside their direct line of vision. The green seemed to relieve fatigue and to sensitize the eye to orange.

WHEN the foreman in a tile factory complained that the girls who sorted the tiles were not working efficiently, an eye expert traced the difficulty, not to color blindness, but to the kind of light under which they were working. He blocked off the windows, installed color-balancing lights, and added reddish-orange color cards to sensitize the eyes. Before the change, the girls could distinguish only four-

teen shades of green; afterwards, the same girls easily picked out thirty-six.

Taking advantage of this peculiar eye reaction, experts now mix different colors of light to "sensitize" the eye most effectively. Combining mercury-vapor and filament-type lights adds the effect of whiteness, lending sheen and beauty to materials. In rolling aluminum, cutting silk lingerie, inspecting oak flooring, and decorating chinaware, best results are obtained when the violet, blue-green, and yellow of the



Case-hardened armor-plate glass for safety goggles is so hard that a hammer blow won't break it. Such glass guards machinists' eyes

mercury-vapor tubes are combined with the violet and red of the filament lamps. This synthetic daylight looks like the real thing, but is much easier on the eyes and makes for better work. The lighting units give the illusion of skylights, but can be put anywhere in a factory. By balancing them for color, they can be made so realistic that the eye cannot detect the change from daylight.

Thus, light, tailored for eye comfort, is being used along with other streamline seeing aids to lighten the burden of your daily job and safeguard the fine mechanism of your eyes.

## Cowbirds Beat Pigeons at Their Own Game

COWBIRDS, the small blackbirds often seen with cattle, have outflown homing pigeons in recent tests of their suitability for carrying messages in warfare. In one trial, a cowbird covered the thirty-three miles between Chicago and Waukegan, Ill., in fifty minutes, beating a racing pigeon by twenty minutes. Another cowbird established a distance record by returning to Waukegan after being released at Vancouver, B. C., 2,500 miles away. Besides their speedy flight, cowbirds have the advantages of inconspicuous color, a factor that would make them of particular usefulness in time of war, since they would be less liable to destruction by enemy sharpshooters.

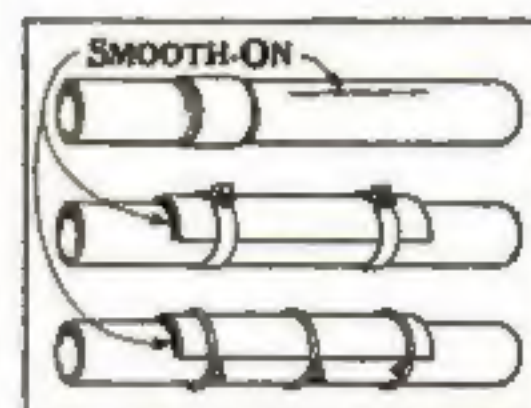
## SAVE MONEY ON YOUR HOME REPAIRS



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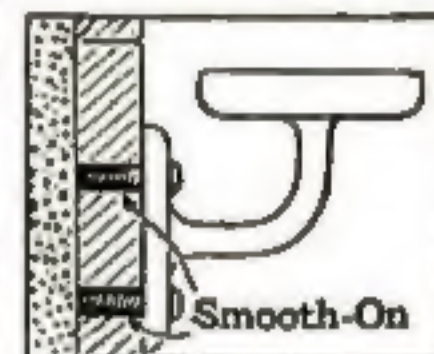
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## Biggest American Navy

(Continued from page 23)

these rakish craft are designed to zig-zag through shellfire and send away their torpedoes at close range, insuring bullseye hits. Two of these boats, capable of skimming the water at upwards of a mile a minute, will soon be undergoing trials at the hands of Government experts.

Besides twin torpedoes, one aimed ahead, the other to the rear, the "jitney destroyers" will be equipped with machine guns and depth bombs to battle aircraft and submarines. Protecting harbors and coast cities will probably be the greatest field of usefulness for these midget battle craft. A dozen, darting swiftly over the water, could make a concerted attack upon a bombarding warship. Even if only one broke through the raking gunfire, its torpedoes would stand a good chance of crippling or sinking the invader.

**IN ADDITION** to forty-six warships—two of them 20,000-ton aircraft carriers—the recently passed naval expansion program provides for the addition of nearly 1,000 fighting planes and a \$3,000,000 dirigible. This aerial fleet will function in cooperation with the warships for observation and attack.

To take care of our rapidly expanding sea force, \$28,000,000 will be spent on shore establishments. The building program will include one of the world's largest dry docks at Pearl Harbor, Hawaii. This gigantic structure will be approximately 1,000 feet long and 132 feet wide. Its depth, at mean low water, will be forty-five feet. Costing \$8,000,000, the new dry dock will accommodate the largest battleship planned and will make extensive repairs on the Pacific Fleet possible without necessitating a return to the American mainland.

For a time, the opinion was expressed that warships larger than we now have would be unable to pass through the Panama Canal. Naval experts, however, recently announced that the link between the Atlantic and the Pacific would accommodate dreadnoughts up to 60,000 tons. This is a third again as large as the biggest ships proposed in the present expansion program.

Thus, Uncle Sam's new navy, most powerful ever to fly the Stars and Stripes, will be able to steam from ocean to ocean, ready to meet any threat of encroachment by a foreign power.

## Rubber Springs Absorb Machine Vibrations

**SPRINGS** made of a specially compounded rubber are now supporting giant manufacturing machines to check vibration and thus cut maintenance costs. As much as ninety percent of the impact of giant punch presses on the floor is absorbed by these springs.



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# Star Diver

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**HALF-TWIST**—Split-second timing—perfect form! Wayne can't risk jitters. Discussing smoking, he says: "Camels are easy on my nerves."



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**INTERMISSION**—and a Camel! "Always after a strenuous exhibition," says champion Wayne, "I smoke a Camel for a very welcome 'lift'!"

—And now, Marshall Wayne pauses for a moment to answer Elnora Greenlaw's question: "Are Camel cigarettes really *different* from the others?"



"THE BIG THING in smoking," says golfer Henry Picard, tournament ace, "is how a cigarette agrees with you from all angles. Camels suit me to a 'T'. Camels are mild—easy on my nerves—they set me right. 'I'd walk a mile for a Camel' any time!"



"You always seem to be smoking Camels, Marshall. Do you find them very different from other kinds?"

"MOST DIVERS I KNOW smoke Camels," says Marshall Wayne, iron man of the American Olympic Diving Squad. "Most expert shots prefer Camels," says Ransford Triggs, famous marksman. Fliers, auto racers, explorers, engineers—people in every sport and occupation of daily life look to Camels for the real pleasure in smoking. "Camels set you right!"

"I certainly do find Camels different, 'Nora—and from so many angles. Camels are so mild—so easy on the throat. Yet they've got plenty of good rich taste. And I can smoke as many Camels as I want. They never tire my taste or get me jumpy. Camels don't bother my nerves the least bit. Besides, Camels are swell during and after meals. They sure help my digestion. Camels agree with me in a lot of ways!"

Camels are a matchless blend of finer, MORE EXPENSIVE TOBACCOS—Turkish and Domestic

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Winston-Salem, North Carolina



PEOPLE DO APPRECIATE THE COSTLIER TOBACCOS IN CAMELS

THEY ARE THE LARGEST-SELLING CIGARETTE IN AMERICA

ONE SMOKER TELLS ANOTHER:

## "CAMELS AGREE WITH ME!"

Tobacco growers have good reason to make Camels *their* cigarette

Read what these planters say about Camel's finer, more expensive tobaccos



"At the tobacco auctions," says grower Leon Mullen, "Camel buyers don't bother with poor lots. They buy the choice tobacco. That's why most of us men who grow and *know* tobacco smoke Camels. We *know* the difference!"



Alton Barnes, planter, says about Camels: "Year after year the best lots of my tobacco have gone to Camels. Naturally, we tobacco growers select the best for our own smoking. So we choose Camels!"